

NEW SYLLABUS MATHEMATICS 1 (6th Edition)
Specific Instructional Objectives (SIOs) for Normal (Academic) Level

SET A

This file contains a specified/suggested teaching schedule for the teachers.

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Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
Term 1 Week 1, 2 & 3	Chapter 1 Factors and Multiples	<ul style="list-style-type: none"> Write down the factors of a whole number. Write down the multiples of a whole number. Distinguish a prime number from a composite number. Express a composite number as a product of prime numbers using index notations. Find the HCF of two or more numbers. Find the LCM of two or more numbers. Find the squares and square roots of numbers. Find the cubes and cube roots of numbers. Estimate mentally the square roots and cube roots of numbers which are not perfect squares or cubes. Use a calculator to find the square, square root, cube root, the power and the nth root of a number. 	1a 1a 1a 1b 1c 1d 1e 1e 1f 1f		Pg 3, 5, 7, 9, 11, 19, 23	Pg 6, 8, 12, 16, 18, 19, 24 Pg 5, 8, 14, 18, 20			Textbook
Term 1 Week 4, 5 & 6	Chapter 2 Integers	<ul style="list-style-type: none"> Use negative numbers in practical situations. Represent integers and order them using the number line. Perform addition of integers. Perform subtraction of integers. 	2a 2a 2b 2c		Pg 36, 40, 41	Pg 45, 46			Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Perform multiplication and division of integers. Apply rules learnt for operating on integers. 	2d 2e						
Term 1 Week 7, 8 & 9	Chapter 3 Rational Numbers	<ul style="list-style-type: none"> Identify a rational number. Order rational numbers on a number line Perform addition and subtraction on rational numbers. Perform multiplication and division on rational numbers. Use the four basic operations on numbers and brackets to simplify rational numbers. Solve word problems involving rational numbers. Represent recurring and terminating decimals. Use a calculator to perform operations involving rational numbers. 	3a 3a 3b 3c 3d 3e 3f 3g		Pg 59, 64	Pg 64	Pg 110 Revision Exercise I No.1 Q4 Pg 113 Revision Exercise I No.5 Q2		Textbook
Term 1 Week 10 & Term 2 Week 1	Chapter 4 Estimation and Approximation	<ul style="list-style-type: none"> Make an estimate of the value of a given problem involving sum, difference, product, quotient, square and square root, cube and cube root of numbers. Round off a number to the required degree of accuracy. State the rules for writing significant figures. 	4a 4b	How does a reporter estimate the number of people attending a rally?	Pg 73, 76-77, 84, 85				Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Round off a number to the required number of significant figures. Identify truncation errors when calculators are used. 	4c 4d						
Term 2 Week 2, 3 & 4	Chapter 5 Fundamental Algebra	<ul style="list-style-type: none"> Use letters to represent numbers and write mathematical statements using symbols. Write down algebraic expressions from given mathematical statements. Evaluate algebraic expressions by substitution. Simplify algebraic expressions involving +, −, x, ÷ and power of an algebraic term. Simplify algebraic expressions involving brackets. Perform addition and subtraction of algebraic expressions. Simplify simple algebraic fractions. Factorisation of simple algebraic expressions. Factorisation of simple algebraic expressions by grouping. 	5a 5a 5b 5c 5d 5e 5f 5g, 5h 5i	Talk about the origin of algebra as shown on pg 92 and state the meaning of some of the common notations used in algebra such as ab , a/b , $a+b$, $a-b$, a^3 , a etc.	Pg 93	Pg 91			Textbook
Term 2 Week 5 & 6	Chapter 6 Number Sequences	<ul style="list-style-type: none"> Recognise simple number patterns and continue a given number sequence. State the rules of a number pattern in terms of the general term. 	6a 6b		Pg 118-119, 126-128	Pg 118, 128, 129, 132			Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Solve non-routine problems using problem solving strategies such as drawing a diagram, using trial and error etc. 	6c						
Term 2 Week 7 & 8	Chapter 8 Perimeter and Area of Simple Geometrical Figures	<ul style="list-style-type: none"> Convert one unit of metric measures of area to another. Calculate the perimeter of simple plane figures like triangles, squares etc., using the various metric units of length and area. State and use the formulas for finding the area of parallelograms and trapeziums. Calculate the area of complex figures involving triangles, rectangles, parallelograms, trapeziums, circles etc. 	8a 8a 8b 8c		Pg 170, 175-176, 180	Pg 173, 174, 180, 181, 185			Textbook
Term 3 Week 1, 2 & 3	Chapter 9 Volume and Surface Area	<ul style="list-style-type: none"> Identify and convert a metric unit of volume into another metric unit such as $1 \text{ m}^3 = 1\,000 \text{ litres}$, $1 \text{ litre} = 1\,000 \text{ cm}^3$ etc. Draw the net of a cuboid. State and use the formulae for finding the volume and surface area of cuboids. State and use the formulae for finding the volume and total surface area of prisms and draw the nets of prisms. State and use the formulae for finding the volume, curved surface area and total surface area of cylinders and to solve problems involving cylinders. 	9a 9a 9a 9b 9c		Pg 195, 196-197, 198-199, 202	Pg 208, 209 Pg 200 Exercise 9a Q8 & Q9 Pg 212 Exercise 9c Q10 Pg 216 Review Questions 9 Q13			Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Solve problems involving hollow cylinders, and solids consisting of prisms, cylinders and cuboids and problems involving densities. 	9c						
Term 3 Week 4, 5 & 6	Chapter 10 Ratio, Rate and Speed	<ul style="list-style-type: none"> State that ratio is used to compare two or more quantities of the same kind and to identify equivalent ratios. Express a ratio in its lowest terms. Convert a ratio in the form $a:b$ to a/b and vice versa as well as to express two or more quantities in ratio form, $a:b$ or $a:b:c$ etc. Increase and decrease a number in a given ratio. Solve problems involving increase and decrease of a quantity in ratio. State that rate is a fraction involving two quantities of different kinds and use common measures of rate in simple problems. Use the concept of average rate in problems. State time using both the 24-hour and 12-hour clock notations and to convert time expressed in 24-hour clock notation to 12-hour clock notation and vice versa. Perform calculations of time in terms of 24-hour clock notation and the 12-hour clock notation as well as solve problems involving time given in 24-hour and 12-hour clock notations. 	10a 10a 10a 10b 10c 10d 10e 10f 10f		Pg 234	Pg 238 Pg 232, 236, 239			Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Apply the results: (a) Average speed = Distance travelled/Time taken, (b) Distance travelled = Average speed \times Time taken, (c) Time taken = Distance travelled/Average speed, to calculate average speed, distance travelled and time taken respectively. Convert speed in km/h to m/s and vice versa. 	10g 10g						
Term 3 Week 7 & 8	Chapter 13 Statistics	<ul style="list-style-type: none"> Collect and classify and organise data logically and present it in the form of a table. Illustrate a given set of information by drawing: (i) a pictogram, (ii) a bar chart. Illustrate a given set of information by drawing a pie chart. Illustrate a given set of information by drawing a line graph. Construct a frequency table to represent a set of data. Construct a histogram for a distribution. Construct a group-frequency table and draw a histogram. 	13a 13a 13b 13c 13d 13d 13e	Discuss misleading data/statistical information on pg 321.	Pg 300-301, 304, 312, 313, 315	Pg 292, 297, 312	Pg 291 & 307 on educational system		Textbook
Term 3 Week 9 & 10	Chapter 14 Basic Geometrical Concepts and	<ul style="list-style-type: none"> Measure a given angle with a protractor. Identify (a) acute, (b) obtuse, and (c) reflex angles. Find the complement and supplement of a given 	14a 14a 14a	Why did our ancestors use 360° as the number of degrees around a	Pg 335, 337, 345-346	Pg 339, 344 Pg 343		GSP: Pg 345-346	Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
	Properties	angle. • Construct a given angle with a ruler and a protractor. • Find unknown angles using the properties of (a) angles at a point, (b) vertically opposite angles, (c) adjacent angles on a straight line. • Find unknown angles using the properties of (a) corresponding, (b) alternate, (c) interior angles for two parallel lines cut by a transversal.	14a 14a 14b	point?					
Term 4 Week 1 & 2	Chapter 11 Percentages	• Express a percentage as a decimal and vice versa. • Express a percentage as a fraction and vice versa. • Express one quantity as a percentage of another. • Calculate a quantity given its percentage. • Compare two quantities using percentages. • Compare quantities for percentages greater than 100%. • Increase and decrease a quantity by a given percentage using a ratio or an equation. • Solve problems involving discount, commission and GST.	11a 11a 11a 11a 11b 11b 11c 11d		Pg 257	Pg 250, 253, 261	Pg 251 Q2 Pg 261 on Value-added Tax and GST Pg 404 Revision Exercise IV No.4 Q3b		Textbook
Term 4 Week 3 & 4	Chapter 15 Angle Properties of	• State the properties of a triangle such as (a) sum of interior angles = 180° , (b) exterior angle = sum of interior opposite angles, and use them to solve problems.	15a		Pg 360, 365-367, 371, 373	Pg 370		GSP: Pg 360, 365-366	Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Solve algebraic word problems using the various problem solving heuristics. Use the symbols $=$, $<$ or $>$ correctly. State and use the rules of simple inequality in problems. 	7g, 7h 7i 7j						
For Sec 2N(A)	Chapter 12 Of Book 1 Functions and Graphs	<ul style="list-style-type: none"> Locate a point on a coordinate plane. Draw a graph of a function. Find the gradient of a straight line. 	12a 12b 12b		Pg 279, 280-282	Pg 270, 278			Textbook
For Sec 2N(A)	Chapter 16 Of Book 1 Geometrical Constructions	<ul style="list-style-type: none"> Construct the perpendicular bisector and angle bisector using a pair of compasses and a ruler. Construct a triangle from given data using a pair of compasses, a ruler and/or a protractor. Construct a quadrilateral from given data using a pair of compasses, a ruler and/or a protractor. 	16a 16a 16b		Pg 384, 387, 394	Pg 385, 392			Textbook

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Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
Term 1 Week 2 & 3	Chapter 1 Factors and Multiples	<ul style="list-style-type: none"> Write down the factors of a whole number. Write down the multiples of a whole number. Distinguish a prime number from a composite number. Express a composite number as a product of prime numbers using index notations. Find the HCF of two or more numbers. Find the LCM of two or more numbers. Find the squares and square roots of numbers. Find the cubes and cube roots of numbers. Estimate mentally the square roots or cube roots of number which is not a perfect square or cube. Use a calculator to find the squares, square roots, cube roots, the power of a number and the nth root of a number. 	1a 1a 1a 1b 1c 1d 1e 1e 1f 1f		Pg 3, 5, 7, 9, 11, 19, 23	Pg 6, 8, 12, 16, 18, 19, 24 Pg 5, 8, 14, 18, 20			Textbook
Term 1 Week 4 & 5	Chapter 2 Integers	<ul style="list-style-type: none"> Use negative numbers in practical situations. Represent integers and order them using the number line. Perform addition of integers. 	2a 2a 2b		Pg 36, 40, 41	Pg 45, 46			Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Perform subtraction of integers. Perform multiplication and division of integers. Apply rules learnt for operating on integers. 	2c 2d 2e						
Term 1 Week 6 & 7	Chapter 3 Rational Numbers	<ul style="list-style-type: none"> Identify a rational number. Order rational numbers on a number line Perform addition and subtraction on rational numbers. Perform multiplication and division on rational numbers. Use the four basic operations on numbers and brackets to simplify rational numbers. Solve word problems involving rational numbers. Represent recurring and terminating decimals. Use a calculator to perform operations involving rational numbers. 	3a 3a 3b 3c 3d 3e 3f 3g		Pg 59, 64	Pg 64	Pg 110 Revision Exercise I No.1 Q4 Pg 113 Revision Exercise I No.5 Q2		Textbook
Term 1 Week 8 & 9	Chapter 4 Estimation and Approximation	<ul style="list-style-type: none"> Make an estimate of the value of a given problem involving sum, difference, product, quotient, squares and square roots, cubes and cube roots of numbers. Round off a number to the required degree of accuracy. 	4a 4b	How does a reporter estimate the number of people attending a rally?	Pg 73, 76-77, 84, 85				Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> State the rules for writing significant figures. Round off a number to the required number of significant figures. Identify truncation errors when calculators are used. 	4c 4d						
Term 2 Week 1 & 2	Chapter 5 Fundamental Algebra	<ul style="list-style-type: none"> Use letters to represent numbers and write mathematical statements using symbols. Write down algebraic expressions from given mathematical statements. Evaluate algebraic expressions by substitution. Simplify algebraic expressions involving $+$, $-$, \times, \div, and power of an algebraic term. Simplify algebraic expressions involving brackets. Perform addition and subtraction of algebraic expressions. Simplify simple algebraic fractions. Factorisation of simple algebraic expressions. Factorisation of simple algebraic expressions by grouping. 	5a 5a 5b 5c 5d 5e 5f 5g, 5h 5i	Talk about the origin of algebra as shown on pg 92 and state the meaning of some of the common notations used in algebra such as ab , a/b , $a+b$, $a-b$, a^3 , \sqrt{a} , etc.	Pg 93	Pg 91			Textbook
Term 2 Week 3 & 4	Chapter 6 Number Sequences	<ul style="list-style-type: none"> Recognise simple number patterns and continue a given number sequence. State the rules of a number pattern in terms of the general term. 	6a 6b		Pg 118-119, 126-128	Pg 118, 128, 129, 132			Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		<ul style="list-style-type: none"> Solve non-routine problems using problem solving strategies such as drawing a diagram, using trial and error, etc. 	6c						
Term 2	Chapter 7	<ul style="list-style-type: none"> Solve simple algebraic equations by inspection. 	7a		Pg 159-161	Pg 141, 153, 155, 161			Textbook
Week 5 & 6	Algebraic Equations and Simple Inequalities	<ul style="list-style-type: none"> State the rules for solving algebraic equations: (a) equal numbers may be added to or subtracted from each side, (b) each side may be multiplied or divided by equal numbers except zero. Use the above rules to solve simple algebraic equations. Use the rules to solve algebraic equations involving fractions and decimals. Find the value of an unknown in a formula by substitution. Construct simple formulae from given word expressions. Express word expressions by algebraic methods. Solve algebraic word problems using the various problem solving heuristics. Use the symbols =, < or > correctly. State and use the rules of simple inequality in problems. 	7b 7c 7d 7e 7f 7g, 7h 7i 7j						

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
Term 2 Week 7 & 8	Chapter 8 Perimeter and Area of Simple Geometrical Figures	<ul style="list-style-type: none"> Convert one unit of metric measure of area to another. Calculate the perimeter of simple plane figures like triangles, squares, etc., using the various metric units of length and area. State and use the formulas for finding the area of parallelograms and trapeziums. Calculate the area of complex figures involving triangles, rectangles, parallelograms, trapeziums, circles, etc. 	8a 8a 8b 8c		Pg 170, 175-176, 180	Pg 173, 174, 180, 181, 185			Textbook
Term 3 Week 1 & 2	Chapter 9 Volume and Surface Area	<ul style="list-style-type: none"> Identify and convert a metric unit of volume into another metric unit such as $1 \text{ m}^3 = 1\,000 \text{ litres}$, $1 \text{ litre} = 1\,000 \text{ cm}^3$, etc. Draw the net of a cuboid. State and use the formulae for finding the volume and surface area of cuboids. State and use the formulae for finding the volume and total surface area of prisms and draw the nets of prisms. State and use the formulae for finding the volume, curved surface area and total surface area of cylinders and to solve problems involving cylinders. Solve problems involving hollow cylinders, and solids consisting of prisms, cylinders and cuboids and problems involving densities. 	9a 9a 9a 9b 9c 9c		Pg 195, 196-197, 198-199, 202	Pg 208, 209 Pg 200 Exercise 9a Q8 & Q9 Pg 212 Exercise 9c Q10 Pg 216 Review Questions 9 Q13			Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		(a) Average speed = Distance travelled/Time taken, (b) Distance travelled = Average speed x Time taken, (c) Time taken = Distance travelled/Average speed, to calculate average speed, distance travelled and time taken respectively. • Convert speed in km/h to m/s and vice versa.	10g 10g						
Term 3 Week 5 & 6	Chapter 11 Percentages	• Express a percentage as a decimal and vice versa. • Express a percentage as a fraction and vice versa. • Express one quantity as a percentage of another. • Calculate a quantity given its percentage. • Compare two quantities using percentage. • Compare quantities for percentages greater than 100%. • Increase and decrease a quantity by a given percentage using a ratio or an equation. • Solve problems involving discount, commission and GST.	11a 11a 11a 11a 11b 11b 11c 11d		Pg 257	Pg 250, 253, 261	Pg 251 Q2 Pg 261 on Value-added Tax and GST Pg 404 Revision Exercise IV No.4 Q3b		Textbook
Term 3 Week 7 & 8	Chapter 12 Functions and Graphs	• Locate a point on a coordinate plane. • Draw a graph of a function. • Find the gradient of a straight line.	12a 12b 12b		Pg 279, 280-282	Pg 270, 278			Textbook
Term 3	Chapter 13	• Collect, classify and organise data logically and	13a	Discuss	Pg 300-301,	Pg 292,	Pg 291 &		Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
Week 9 & 10	Statistics	<p>present it in the form of a table.</p> <ul style="list-style-type: none"> Illustrate a given set of information by drawing: (i) a pictogram, (ii) a bar chart. Illustrate a given set of information by drawing a pie chart. Illustrate a given set of information by drawing a line graph. Construct a frequency table to represent a set of data. Construct a histogram for a distribution. Construct a group-frequency table and draw a histogram. 	<p>13a</p> <p>13b</p> <p>13c</p> <p>13d</p> <p>13d</p> <p>13e</p>	misleading data/statistical information on pg 321.	304, 312, 313, 315	297, 312	307 on educational system		
Term 4	Chapter 14	<ul style="list-style-type: none"> Measure a given angle with a protractor. Identify (a) acute, (b) obtuse, and (c) reflex angles. Find the complement and supplement of a given angle. Construct a given angle with a ruler and a protractor. Find unknown angles using the properties of: (a) angles at a point, (b) vertically opposite angles, (c) adjacent angles on a straight line. Find unknown angles using the properties of: 	<p>14a</p> <p>14a</p> <p>14a</p> <p>14a</p> <p>14a</p> <p>14b</p>	Why did our ancestors use 360° as the number of degrees around a point?	Pg 335, 337, 345-346	Pg 339, 344 Pg 343		GSP: Pg 345-346	Textbook

Week	Topic	Specific Instructional Objectives	Exercises	Maths Communication	Maths Investigation	Problem Solving	NE	IT	Resources
		(a) corresponding, (b) alternate, (c) interior angles for two parallel lines cut by a transversal.							
Term 4 Week 2 & 3	Chapter 15 Angle Properties of Polygons	<ul style="list-style-type: none"> State the properties of a triangle such as: (a) sum of interior angles = 180°, (b) exterior angle = sum of interior opposite angles, and use them to solve problems. State and use the geometrical properties of: (a) trapeziums, (b) parallelograms, (c) rectangles, (d) rhombuses, (e) squares and (f) kites, and use them to solve problems involving these figures. State the sum of the interior angles of a convex polygon and the sum of its exterior angles and to use them to solve problems involving angle properties of convex polygons. 	15a 15b 15c		Pg 360, 365-367, 371, 373	Pg 370		GSP: Pg 360, 365-366	Textbook
Term 4 Week 4 & 5	Chapter 16 Geometrical Constructions	<ul style="list-style-type: none"> Construct the perpendicular bisector and angle bisector using a pair of compasses and a ruler. Construct a triangle from the given data using a pair of compasses, a ruler or a protractor. Construct a quadrilateral from the given data using a pair of compasses, a ruler or a protractor. 	16a 16a 16b		Pg 384, 387, 394	Pg 385, 392			Textbook

Chapter 1

Secondary 1 Mathematics
Chapter 1 Factors and Multiples

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 5)

17 and 71

Just For Fun (pg 8)

Multiply the first remainder by 70, the second remainder by 21 and the third remainder by 15. Add these together and subtract 105 from it.

For example, take the number of soldiers to be 79.

$79 \div 3$ has a remainder of 1.

$79 \div 5$ has a remainder of 4, $79 \div 7$ has a remainder of 2.

\therefore the number of soldiers $= 70 + 4 \times 21 + 2 \times 15 - 105 = 79$

Just For Fun (pg 14)

$$\begin{array}{r} 75 \\ \times 335 \\ \hline 525 \\ 225 \\ \hline 225 \\ \hline 25275 \end{array}$$

Just For Fun (pg 18)

18 as $(1 + 8)^2 = 81$

Just For Fun (pg 20)

24 as $2^3 + 4^3 = 3(24)$

Secondary 1 Mathematics

Chapter 1 Factors and Multiples

GENERAL NOTES

One common misconception that students have about prime numbers is that 1 is a prime number. The fact that 1 is not a prime number should be emphasised time and again, even at Secondary 2, 3 and 4 levels.

The Sieve of Eratosthenes to find the first few prime numbers and Sundaram's Sieve may be used as interesting activities for the class. The master transparencies provided may be useful here.

If time permits, the various problem-solving activities provided on the margin of the book may be worth exploring by students.

Some students may find one of the two methods of finding H.C.F and L.C.M easier than the other. Encourage students to learn both methods.

The types of calculators available at present in the market use Direct Algebraic Logic (DAL). Calculators of this kind are easy to use. However, there are also students who use calculators that have been passed down to them. It is useful that students be shown how to use different versions of the calculator. If students forget to bring a calculator during a test or an examination and have to borrow, they will not be at a total loss as to how to use it.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks: 

Secondary 1 Multiple-Choice Questions

Chapter 1 Factors and Multiples

- The difference between the square of 7 and the sum of the first 7 odd numbers is _____.
(A) 2 (B) 3 (C) 4 (D) 0 (E) 6 ()
- What is the L.C.M. of $3 \times 3 \times 4$, $4 \times 4 \times 3$ and $3 \times 4 \times 7$?
(A) $3 \times 3 \times 7$ (B) 3×7 (C) $3 \times 4 \times 4 \times 7$
(D) $3 \times 3 \times 4 \times 4 \times 7$ (E) $3 \times 4 \times 7$ ()
- Which is the positive square root of 676?
(A) 2×7 (B) 2×13 (C) 3×12
(D) 4×9 (E) 2×11 ()
- If a and b are two prime numbers such that $a < b$ and $(a + b)$ is another prime number, then a is _____.
(A) 2 (B) 3 (C) 7 (D) 11 (E) 13 ()
- A value of x which shows the statement “If the sum of the digits of the whole number x is a multiple of 8, then x is divisible by 8” to be false is _____.
(A) 62 (B) 80 (C) 88 (D) 152 (E) 224 ()
- How many prime numbers less than 100 have 3 as the ones digit?
(A) 5 (B) 6 (C) 7 (D) 8 (E) 9 ()
- Express 5 175 as a product of prime factors.
(A) $15^2 \times 23$ (B) $115 \times 3^2 \times 5$ (C) $5^2 \times 3^2 \times 23$
(D) $5 \times 3 \times 23$ (E) $5^2 \times 3 \times 23$ ()
- Which of the following are prime numbers?
(1) 101 (2) 127 (3) 199 (4) 221
(A) (1) and (4) (B) (2) and (3) (C) (1), (2) and (3)
(D) (1), (3) and (4) (E) (1), (2), (3) and (4) ()
- By expressing $13\,824 \times 42\,875$ as a product of prime factors, find the cube root of $13\,824 \times 42\,875$.
(A) 12×35 (B) 24×45 (C) 28×30 (D) 35×36 (E) 35×72 ()

10. $(5^3 - 3^3)^2 - (4^3 - 2^3)^2$ is equal to _____.

(A) 14×62 (B) 21×77 (C) 42×154 (D) 56×200 (E) 64×64

()

Answers

- | | | | | |
|------|------|------|------|-------|
| 1. D | 2. D | 3. B | 4. A | 5. A |
| 6. C | 7. C | 8. C | 9. C | 10. C |

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: min

Class: _____

Marks: 

Secondary 1 Mathematics Test Chapter 1 Factors and Multiples

1. (a) Find the sum of the first four prime numbers that end with the digit 7. [2]
(b) Express 2 592 as the product of prime factors. [1]
2. Find (a) the highest common factor (HCF), [1]
(b) the lowest common multiple (LCM) of 27, 36 and 90. [1]
3. (a) Express 1 296 as a product of prime factors and hence find the square root of 1 296. [2]
(b) Find the LCM of 35, 63 and 140. [2]
4. (a) Write down the even prime number and the largest prime number less than 100 that ends with the digit 9. [2]
(b) Express 2 744 as a product of prime factors and hence find the cube root of 2 744. [2]
5. (a) Write down the largest prime factor of 1 224. [1]
(b) Find the smallest number which when divided by 15 or 18 leaves a remainder of 13. [2]
6. If $1\,200 = 2^a \times 3^b \times 5^c$, find the values of a , b and c . [2]
7. Without using a calculator, find the square root of
(a) 784, [1]
(b) 1 936. [2]
8. Without using a calculator, find the cube root of
(a) 3 375, [2]
(b) 5 832. [2]
9. Find the HCF of
(a) 28, 56 and 77, [1]
(b) $2^4 \times 3^3 \times 5$ and $2^2 \times 3^4 \times 5^3$. [2]

10. Find the LCM of
- (a) 4, 18 and 27, [1]
 - (b) $3^2 \times 5$ and $3 \times 2^2 \times 5^2$. [2]
11. (a) Write down all the prime numbers between 41 and 61. [1]
- (b) Find the difference between the largest and the smallest prime numbers that lie between 21 and 92. [2]
12. (a) Express 2 310 as a product of prime factors and write down the sum of all the prime factors. [2]
- (b) If the HCF and LCM of two numbers are 14 and 252 respectively and one of the numbers is 28, find the other number. [2]
13. (a) Write down the prime numbers that are in the following list of numbers.
7, 9, 2, 13, 33, 21, 31, 51, 37, 91, 1, 57 [2]
- (b) Name the first five prime numbers after 90 and the largest prime number before 150. [2]
14. Given that the 4-digit number $7xy9$ is a perfect square, complete the following.
- (a) The square root of $7xy9$ has _____ digit/digits. [1]
 - (b) The square root of $7xy9$ must end in _____ or _____. [1]
 - (c) The value of $x + y$ is _____. [2]
15. Given that the 5-digit number $54ab2$ is a perfect cube, complete the following.
- (a) The cube root of $54ab2$ has _____ digit/digits. [1]
 - (b) The cube root of $54ab2$ must end in _____. [1]
 - (c) The value of $a \times b$ is _____. [2]
16. (a) Find the HCF and LCM of 14 and 21. [1]
- (b) Using the results in (a), verify that the product of the HCF and the LCM of two numbers is equal to the product of the two numbers themselves. [1]
- (c) Find
- (i) the product of two numbers if their HCF and LCM are 15 and 48 respectively, [1]
 - (ii) the HCF of two numbers if their product is 1536 and their LCM is 96.
17. (a) Find the HCF and LCM of 12 and 32. [1]
- (b) Is it true that the product of the HCF and the LCM of two numbers is equal to the product of the two numbers themselves?
Verify using the results in (a). [1]
- (c) Find the HCF and LCM of 6, 8 and 12. [1]
- (d) Is it true that the product of the HCF and the LCM of three numbers is equal to the product of the three numbers themselves?
Verify using the results in (c). [1]

18. (a) Write down the largest 3-digit number that is divisible by 2, 3 and 5. [1]
 (b) Is the product of two prime numbers a prime number or a composite number? [1]
 Give an example to support your answer. [1]
 (c) Is the product of two natural numbers always a composite number? [1]
 Give an example to support your answer. [1]
19. Evaluate without using a calculator,
 (a) $2^3 \div \sqrt[3]{64} + 11^2 - \sqrt{81} \times 3^2$ [2]
 (b) $8^2 + 4^3 - (\sqrt{169} + \sqrt{196} - \sqrt{225})$ [2]
20. Evaluate without using a calculator,
 (a) $(\sqrt[3]{125} + \sqrt{144} - 2^3) \div 3$ [2]
 (b) $(13 - 9)^2 + (17 + 11 - 23)^3 - \sqrt{256} \div 4$ [2]
21. Evaluate without using a calculator,
 (a) $80^2 \div (\sqrt{196} - \sqrt[3]{216}) + (2^3)^2 + 81$ [2]
 (b) $\sqrt[3]{12^2 + 10^2 + 8^2 + 6^2 - 1^2}$ [2]
22. (a) Express 7225 and 9261 as products of prime numbers. [2]
 (b) Hence, evaluate $\sqrt{\sqrt{7225} - \sqrt[3]{9261}}$. [2]
23. Arrange the following set of numbers in ascending order.
 $3 \times 2^2, \sqrt{2^4 \times 5^2}, \sqrt{16^2 + 8^3 + 4^2}, \sqrt[3]{(9^3 - 13^2)} \div \sqrt{16} - \sqrt{225}$ [4]
24. Find the product of the HCF and the LCM of 21, 28 and 42. [3]
25. (a) Express 480 and 1620 as products of prime factors. [2]
 (b) Hence, find the sum of the HCF and the LCM of 480 and 1620. [2]
26. Find the HCF and the LCM of 360, 2 700 and 7 200, giving your answers in index notation. [4]
27. Siew Pei has a rectangular sheet of paper 84 cm by 126 cm. She needs to divide it evenly into squares, each as large as possible. Find
 (a) the length of the side of each square, [2]
 (b) the total number of such squares. [1]
28. Three ribbons of lengths 160 cm, 192 cm and 240 cm respectively are to be cut into a number of equal pieces without any leftover. Find
 (a) the greatest possible length of each piece, [2]
 (b) the total number of pieces cut from the three ribbons. [1]

29. Robert, John and Peter were given 3 equal lengths of rods. Robert cut his rod into pieces 42 cm long, John cut his rod into pieces 24 cm long and Peter cut his rod into pieces 60 cm long. If there was no remainder in each case, what was the shortest length of rod given to each of them? [3]
30. (a) Find the smallest number of cubes which can be packed exactly into a box 63 cm by 45 cm by 18 cm. [2]
 (b) What is the volume of each cube? [1]
31. Robert, John and Paul start to run from the same point, in the same direction, around a circular track. If they take 126 seconds, 154 seconds and 198 seconds respectively to complete one round along the track, when will they next meet again at the starting point?
32. Find the least number of cubes that can be cut from a $8\text{m} \times 12\text{m} \times 16\text{m}$ cuboid. [2]
33. (a) Express [2]
 (i) 216 000 and
 (ii) 518 400 as a product of prime factors.
 (b) Hence find [4]
 (i) $\sqrt[3]{216\,000}$,
 (ii) $\sqrt{518\,400}$,
 (iii) the H.C.F. of 216 000 and 518 400,
 (iv) the L.C.M. of $\sqrt[3]{216\,000}$ and $\sqrt{518\,400}$.
34. Make an estimate of each of the following.
 (a) $39^2 + 51^2 - \sqrt{9900} + \sqrt[3]{65}$ [1]
 (b) $29^3 \div \sqrt{8200} + \sqrt[3]{28} \times 31^2$ [1]
35. Evaluate the following without using a calculator.
 (a) $9^2 \div \sqrt[3]{27} + 4^3 \times \sqrt[3]{125} - \sqrt{625}$ [2]
 (b) $6^3 - \sqrt[3]{343} \times 12^2 \div \sqrt{441} + \sqrt{900} \times 3^3$ [2]
36. Evaluate the following using a calculator.
 (a)
$$\frac{\sqrt[3]{13824} \times \sqrt{676} + \sqrt{13\,182^2 \div 169^3}}{3^2 \times \sqrt{121} - \sqrt[3]{729}}$$
 [2]
 (b)
$$\frac{\sqrt[3]{15\,625} \times 43^2 - 35^3 + \sqrt{422\,500 \div 13}}{\sqrt[3]{38^3 - (123^2 + 8^3)} + 73}$$
 [2]

Answers

1. (a) 108 (b) $2^5 \times 3^4$
2. (a) 9 (b) 540
3. (a) $2^4 \times 3^4$, 36 (b) 1 260
4. (a) 2, 89 (b) $2^3 \times 3^3$, 14
5. (a) 17 (b) 283
6. $a = 4$, $b = 1$, $c = 2$
7. (a) 28 (b) 44
8. (a) 15 (b) 18
9. (a) 7 (b) 540
10. (a) 108 (b) 900
11. (a) 43, 47, 53, 59 (b) 66
12. (a) 28 (b) 126
13. (a) 2, 7, 13, 31, 37 (b) 97, 101, 103, 107, 109; 149
14. (a) 2 (b) 3 or 7 (c) 11
15. (a) 2 (b) 8 (c) 56
16. (a) 7, 42 (b) $14 \times 21 = 7 \times 42 = 294$
(c) (i) 720 (ii) 16
17. (a) 4, 96 (b) Yes, $12 \times 32 = 4 \times 96 = 384$
(c) 2, 24 (d) No, $2 \times 24 \neq 6 \times 8 \times 12$
18. (a) 990 (b) a composite number; $2 \times 3 = 6$
(c) No; $1 \times 3 = 3$, a prime number
19. (a) 42 (b) 116
20. (a) 3 (b) 137

21. (a) 80 (b) 7
22. (a) $5^2 \times 17^2, 3^3 \times 7^3$ (b) 8
23. $\sqrt[3]{(9^3 - 13^2) \div \sqrt{16} - \sqrt{225}}, 3 \times 2^2, \sqrt{2^4 \times 5^2}, \sqrt{16^2 + 8^3 + 4^2}$
24. 588
25. (a) $2^5 \times 3 \times 5, 2^2 \times 5 \times 3^4$ (b) 13 020
26. (a) $2^2 \times 5 \times 3^2, 2^5 \times 3^3 \times 5^2$
27. (a) 42 cm (b) 6
28. (a) 16 cm (b) 37
29. 840 cm
30. (a) 70 (b) 729 cm^3
31. 23 minutes and 6 seconds later
32. 24 cubes
33. (a) (i) $2^6 \times 3^3 \times 5^3$ (ii) $2^8 \times 3^4 \times 5^2$
 (b) (i) 60 (ii) 720
 (iii) $2^6 \times 3^3 \times 5^2 = 43\,200$ (iv) $2^4 \times 3^2 \times 5 = 720$
34. (a) 4004 (b) 3000
35. (a) 322 (b) 978
36. (a) 7 (b) 100

Chapter 2

Secondary 1 Mathematics

Chapter 2 Integers

GENERAL NOTES

Many pupils find manipulation of integers and real numbers difficult and sometimes confusing. You may wish to go slower in this chapter and spend more time to re-emphasise the concept of operating with integers and in particular, negative numbers.

To help your students get familiar with rules for addition and subtraction of integers, you can introduce a simple computing device called a nomograph to them. A nomograph consists of three parallel scales **A**, **B** and **C** perpendicular to a zero line as shown in Fig. 1.

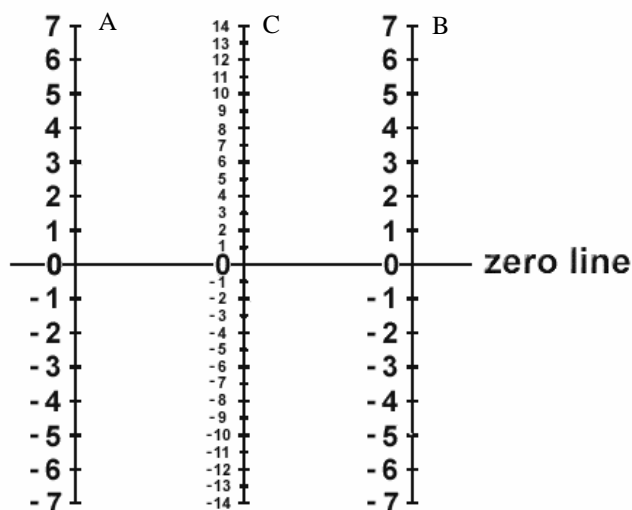


Fig. 1

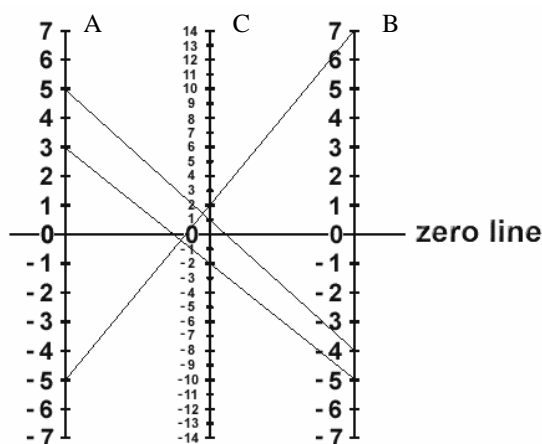
Scale **A** and Scale **B** are of the same distance from Scale **C**. The length of one unit on scale **A** is the same as the length of one unit on Scale **B** while the length of one unit on Scale **C** is half the length of one unit on Scale **A** and on Scale **B**.

Make photocopies of the nomograph for your students to try adding and subtracting integers.

For example, to add 3 and -5 , use the edge of a ruler to line up 3 on Scale **A** and -5 on Scale **B**, as shown in Fig. 2. The edge of the ruler passes through -2 on Scale **C**.

$\therefore 3 + (-5) = -2$ We know that $7 - 2 = 5$ because $2 + 5 = 7$

\therefore to find $2 - 7$ is to find a number x such that $x + 7 = 2$.



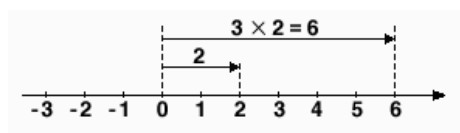
Similarly, to find $1 - (-4)$ is to find a number y such that $y + (-4) = 1$.

The nomograph in Fig. 2 shows that $(-5) + 7 = 2$ and $5 + (-4) = 1$
 $\therefore 2 - 7 = -5$ and $1 - (-4)$

Fig. 2

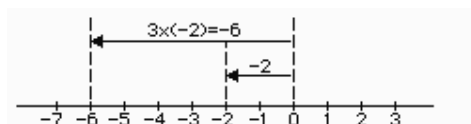
You may wish to help your students learn the rules for multiplication of integers using number lines as illustrated below.

(1) 3×2



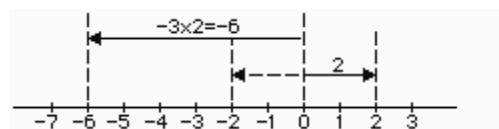
The second factor 2 indicates a trip to the right from 0 to 2 and the first factor 3 tells you to extend it to three times its length in the same direction. $\therefore 3 \times 2 = 6$.

(2) $3 \times (-2)$

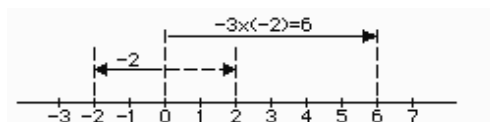


The diagram shows that a trip or length 2 units to the left is extended three times its length in the same direction.

(3) -3×2



(4) $-3 \times (-2)$



In (3) and (4), multiplying by -3 can be taken as an indication to reverse the direction of the trip and extend it to three times its length.

Reminder

Remind your students to be careful when performing multiplication or division of real numbers. The following may be of help to your students:

$$(+)\times(+)=(+)$$

$$(+)\times(-)=(-)\text{ or }(-)\times(+)=(-)$$

$$(-)\times(-)=(+)$$

Your student may want to visit <http://www.funbrain.com/linejump/index.html> to play the line jumper game by choosing the various difficulty levels.

http://www.mathgoodies.com/lessons/toc_vol5.html contains materials on integers that may help your students understand various aspects of integers better.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks:

10

Secondary 1 Multiple-Choice Questions

Chapter 2 Integers

1. Which one of the following is an integer?
(A) 8.23 (B) 2.3 (C) $\sqrt{2}$ (D) $\sqrt{4}$ (E) $\frac{22}{7}$ ()
2. Subtract 20 from the product of (-4) and (-15) . The result is _____.
(A) 80 (B) 40 (C) 39 (D) 40 (E) 80 ()
3. The value of $(-6)^2 + (-4)^3$ is _____.
(A) 24 (B) -28 (C) 4 (D) -4 (E) -18 ()
4. Evaluate $[3 - (-2)]^2$
(A) 1 (B) 5 (C) 25 (D) 10 (E) 15 ()
5. Evaluate $(-7) \times 2 - 6 \times (-9)$
(A) 40 (B) -68 (C) -180 (D) 68 (E) -40 ()
6. Dividing the sum of 4 and -6 by -2 , we obtain _____.
(A) 1 (B) -5 (C) 2 (D) -1 (E) -5 ()
7. Evaluate $(-3)^3 + (-1)^3$
(A) -28 (B) -10 (C) 10 (D) 28 (E) -27 ()

Find the next two terms for each of the following number sequences.

8. 2, 4, 8, 16, 32,
(A) 36, 38 (B) 36, 128 (C) 64, 128
(D) 64, 512 (E) 64, 132 ()
9. 6, 11, 10, 15, 14,
(A) 13, 12 (B) 13, 18 (C) 13, 8
(D) 19, 18 (E) 18, 19 ()
10. The average of 30, -12 and a third number is -2 .
What is the third number?
(A) -3 (B) 3 (C) 24 (D) -24 (E) -12 ()

Answers

- | | | | | |
|------|------|------|------|-------|
| 1. D | 2. D | 3. B | 4. C | 5. A |
| 6. D | 7. A | 8. C | 9. D | 10. D |

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: min

Class: _____

Marks: 

Secondary 1 Mathematics Test Chapter 2 Integers

1. Evaluate the following :

- (a) $13 + (-17)$ [1]
- (b) $-8 - (-11)$ [1]
- (c) $(-5) \times 19 \times (-2)$ [1]
- (d) $39 \div (-13)$ [1]

2. Find the value of
- (a) $(-17) - (-35)$, [1]
 - (b) $(-100) \div (-25)$, [1]
 - (c) $(-105) + 27 \times (-8) - 144 \div (-9)$. [2]

3. Evaluate each of the following.

- (a) $(-18) - 6 \times (-3)$, [1]
- (b) $32 + (-16) \div (-2)^2$, [1]
- (c) $[109 - (-19)] \div (-2)^3 \times (-5)$. [2]

4. Evaluate
- (a) $(47 + 19 - 36) \div (-5)$, [1]
 - (b) $\{[(-23) - (-11)] \div 6 - 7 \div (-7)\} \times 1997$. [3]

5. Evaluate each of the following.

- (a) $19 + (-26)$ [1]
- (b) $(-11) \times [-52 + (-17) - (-39)]$ [2]
- (c) $(13-9)^2 - 5^2 - (28-31)^3$ [2]

6. Evaluate the following.

- (a) $(-11) - (-111)$ [1]
- (b) $(-4) \times 7 \times 25$ [1]
- (c) $(-72) \div [-14 - (-23)]$ [2]
- (d) $[(-5) \times (-8)^2 - (-2)^3 \times 7] \div (-11)$ [3]

7. Find

- (a) $-7 + (-4) - (-9) - 13$, [1]
- (b) $(-3) \times (-75) \div (-25)$, [1]
- (c) $5 \times (-4)^2 - (-3)^3$. [2]

8. Copy and complete the following statements with “<” or “>”.
- (a) -10 _____ $\frac{1}{2}$ [1]
 (b) -2 _____ -3 [1]
9. Simplify $-22 + (-5) + [12 \div (-3) - (-5) \times 7] \div (-31)$. [3]
10. For each of the following sequences, write down the next three terms.
- (a) 16, 14, 11, 7, ... [2]
 (b) 3, 2, -4, -5, 10, 9, ... [2]
11. Evaluate (a) $6 - (-3)^2 + 6 \div (-3)$, [1]
 (b) $4 - (-4)^3 - (-7)^2$, [1]
 (c) $16 + (-21) \div 7 \times \{9 + [56 \div (-8)]\}$. [2]
12. Evaluate (a) $[-25 + (-8)] - [(-15) + 7]$, [2]
 (b) $8 \div [3 + (-15)] \div [(-2) \times 4 \times (-3)]$. [2]
13. Fill in the boxes with > or <:
- (a) 6 -6 (b) -12 -16 (c) $(-1)^3$ 3 [3]
14. Which of these statements are correct? [4]
 (a) $(-9) \div 3 = -3$ (b) $0 \div 4 = 0$ (c) $(-5) \div 0 = -5$ (d) $(-5) \div 0 = 0$
15. Arrange the integers in ascending order. [2]
 $-2, -8, 0, -50, -100$
16. Arrange the integers in descending order. [2]
 $3, -15, 2, -1, 8$
17. Put the correct sign, > or <, between each pair of temperatures below. [3]
 (a) $-10^\circ, 0^\circ$ (b) $30^\circ, 18^\circ$ (c) $-13^\circ, -20^\circ$
18. If -15 represents 15 m below sea-level, then $+20$ represents _____. [1]
19. If $+90^\circ$ represents rotating 90° clockwise, then -90° represents rotating _____. [1]
20. Arrange the following in descending order [3]
 (a) $5 + (-3) \times 2$, (b) $(-2) \times 4 + (-15) \div (-3)$,
 (c) $14 - (-4)^2$, (c) $[(-7) - (-9)]^3$

21. Some boys were seated around a circular table. A pile of 41 sweets were passed around the table, starting from Alvin. Each boy took the same number of sweets. When the sweet reached Alvin again, there was only 1 sweet left. If Alvin took the last sweet and he had altogether 6 sweets, how many boys were there? [3]

Answers

1. (a) -4 (b) 3 (c) 190 (d) -3

2. (a) 18 (b) 4 (c) -281

3. (a) 0 (b) 4 (c) 80

4. (a) -6 (b) -1997

5. (a) -7 (b) -330 (c) 18

6. (a) 100 (b) -700 (c) -8 (d) 24

7. (a) -15 (b) -9 (c) 107

8. (a) < (b) >

9. -28

10. (a) 2, -4, -11 (b) -18, -19, 38

11. (a) -5 (b) 19 (c) 10

12. (a) -25 (b) $-\frac{1}{36}$

13. (a) > (b) > (c) <

14. (a), (b)

15. -100, -50, -8, -2, 0

16. 8, 3, 2, -1, -15

17. (a) < (b) > (c) >

18. 20 m above sea-level

19. 90° anti-clockwise

20. (d), (a), (c), (b)

21. 8

Chapter 3

Secondary 1 Mathematics
Chapter 3 Rational Numbers

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 57)

$$1 - \left(\frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} \right) = \frac{1}{20}$$

∴ There are altogether $4 \times 20 = 80$ animals.

Secondary 1 Mathematics

Chapter 3 Rational Numbers

GENERAL NOTES

Most of the materials in this chapter were covered in primary schools. You may wish to spend less time on this chapter so as to leave more time for other chapters.

When you come to the section on recurring decimals, you may wish to show your students how a recurring decimal can be expressed as a fraction.

Take $0.\dot{8}\dot{7}$ as an example.

$$\text{Let } x = 0.\dot{8}\dot{7}$$

$$100x = 87.\dot{8}\dot{7}$$

$$100x - x = 87.\dot{8}\dot{7} - 0.\dot{8}\dot{7}$$

$$99x = 87$$

$$\therefore x = \frac{87}{99}$$

As an investigative exercise, you may wish to ask your students to find a quick rule of converting a recurring decimal to a fraction.

Students may ask if there are numbers which are non-recurring and non-terminating. To answer such a question, show them non-recurring and non-terminating numbers like $\sqrt{2}$, π and so on. Another interesting way is to state a pattern that will produce non-recurring and non-terminating numbers. One simple example is the number 0.808 808 880 888 80 ... in which successive groups of the digit 8 are separated by a “0” with each successive group containing one more ‘8’ than the preceding one.

Students should be reminded to leave their answers in fractions as mixed numbers.

Common Errors Made By Students

When you come to fractions, you may wish to point out errors like:

$$(i) \frac{1}{3} + \frac{3}{4} = \frac{4}{7} \quad (ii) \frac{1}{\cancel{3}} + \frac{\cancel{3}}{4} = 1\frac{1}{4} \quad (iii) \frac{\overset{2}{\cancel{4}}+3}{\cancel{2}} = 5$$

Websites worth visiting:

- <http://www.visualfractions.com/>

An on-line tutorial that offers instruction and practice in identifying and operating on fractions. Included are four games and a resource page.

- <http://www.iln.net/>

An interactive learning network which you can join as a member. It is free. Members can gain access to many mathematics lessons including fractions and decimals in the form of videos as well animations.

NE MESSAGES

Revision Exercise I No.1 Page 110 Q4

Ask pupils if they have been to Sentosa. How many times have they been there and what do they think of the place? Do they know that it is one of the important tourist spots in Singapore? It has helped to draw tourists to the country thus contributing to the economy of Singapore. Do they have any idea as to how to make the island more attractive? Can they name some of the people in Singapore whose livelihoods depend very much on the tourism trade?

Revision Exercise I No.5 Page 113 Q2

Ask pupils how many of them have been to a concert in the past year. With the government's push to develop Singapore as a centre of arts in the new millenium and the effort to build a new performing arts centre at the Esplanade, pupils are encouraged to participate in the arts scene and help to develop Singapore into a centre of arts in the region.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks:

10

Secondary 1 Multiple-Choice Questions Chapter 3 Rational Numbers

1. The smallest of the fractions $\frac{10}{11}$, $\frac{5}{6}$, $\frac{7}{8}$, $\frac{11}{13}$ and $\frac{13}{15}$ is _____.
(A) $\frac{10}{11}$ (B) $\frac{5}{6}$ (C) $\frac{7}{8}$ (D) $\frac{11}{13}$ (E) $\frac{13}{15}$ ()
2. Evaluate $2.675 + 204.008 + 0.000\ 7$ without using a calculator.
(A) 206.683 7 (B) 206.72 (C) 206.8
(D) 206.863 7 (E) 224.68 ()
3. Evaluate $\frac{15^2 - 10^2}{15^2 + 10^2}$.
(A) $\frac{1}{13}$ (B) $\frac{1}{5}$ (C) $\frac{5}{13}$ (D) $\frac{6}{13}$ (E) $2\frac{3}{5}$ ()
4. $\frac{\frac{1}{3}(4\frac{1}{4} - 3\frac{1}{5})}{1\frac{2}{5}}$ equals _____.
(A) $\frac{1}{5}$ (B) $\frac{1}{4}$ (C) $\frac{8}{21}$ (D) $\frac{13}{21}$ (E) $\frac{3}{4}$ ()
5. $\frac{3}{20}$ of a school's population are teachers. There are 1326 students in the school. The total number of teachers and students is _____.
(A) 15 600 (B) 8 840 (C) 4 680 (D) 1 560 (E) 1460 ()
6. Evaluate $\sqrt{\frac{5}{8} + \frac{9}{5} + \frac{13}{8} + \frac{11}{5}}$.
(A) $\frac{2}{5}$ (B) $\frac{5}{2}$ (C) 2 (D) 4 (E) 5 ()
7. $\sqrt[3]{\frac{13}{16} + \frac{9}{5} + \frac{9}{16} + \frac{1}{5}} =$ _____.
(A) $\frac{27}{8}$ (B) $\frac{9}{4}$ (C) $\frac{3}{2}$ (D) 2 (E) 4 ()

8. Mrs. Seah is baking 12 cakes. She needs $2\frac{1}{2}$ cups of flour for each of the first 9 cakes and $2\frac{3}{4}$ cups of flour for each of the remaining 3 cakes. How many cups of flour does Mrs. Seah need in all?

(A) $25\frac{1}{4}$ (B) $30\frac{3}{4}$ (C) $31\frac{3}{4}$ (D) $45\frac{1}{4}$ (E) $60\frac{1}{4}$ ()

9. The missing term in the sequence $\frac{1}{16}, \frac{1}{8}, \frac{3}{16}, \frac{1}{4}, (\quad), \dots$ is _____.

(A) $\frac{3}{8}$ (B) $\frac{1}{8}$ (C) $\frac{1}{16}$ (D) $\frac{3}{16}$ (E) $\frac{5}{16}$ ()

10. Find the next two terms of the sequence: $\frac{81}{64}, -\frac{27}{32}, \frac{9}{16}, -\frac{3}{8}, \frac{1}{4}$.

(A) $-\frac{3}{8}, \frac{9}{16}$ (B) $-\frac{3}{4}, \frac{1}{2}$ (C) $\frac{3}{4}, -\frac{1}{2}$
 (D) $-\frac{1}{6}, \frac{1}{9}$ (E) $\frac{1}{6}, -\frac{1}{9}$ ()

Answers

- | | | | | |
|------|------|------|------|------|
| 1. B | 2. A | 3. C | 4. B | 5. D |
| 6. B | 7. C | 8. B | 9. E | 10.D |


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks: 

Secondary 1 Mathematics Test Chapter 3 Rational Numbers

1. Evaluate, giving each answer as a fraction in its simplest form.

(a) $2\frac{3}{5} + 3\frac{3}{4}$ [1]

(b) $(5\frac{1}{3} \times \frac{1}{4}) - (3\frac{1}{3} \div 2\frac{6}{7})$ [3]

2. (a) Evaluate $42 \div (2 + 0.4)$. [1]

(b) Simplify $2\frac{2}{7} \times (3\frac{1}{3} - 1\frac{7}{12})$ [2]

3. (a) Express $\frac{4}{7}$ as a decimal, correct to 2 decimal places. [1]

(b) Multiply 104.25 by 0.5124. [2]

(c) Simplify $2\frac{17}{45} - 1\frac{5}{18} + 4\frac{1}{10}$. [2]

4. (a) Express 14.7316 correct to three decimal places. [1]

(b) Simplify $24.36 \times 0.55 - [0.98 \times (4.26 \div 0.4)]$ correct to one decimal place. [2]

5. (a) Find the value of $\frac{5.67 \times 0.4}{0.63}$. [2]

(b) Evaluate $1\frac{4}{13} \div 3\frac{2}{5} \times 1\frac{4}{9}$. [2]

6. Evaluate (a) $42.7 + 17.45 - 31.4$. [1]

(b) $(2\frac{4}{7} \div 1\frac{9}{14} - 1\frac{8}{23}) \times (2\frac{1}{3} + 2\frac{4}{15})$ [3]

7. (a) Express 0.72 as a fraction in its lowest form. [1]

(b) Express $\frac{5}{7}$ as a decimal, giving your answer correct to two decimal places. [1]

(c) Evaluate $1\frac{1}{2} \times \frac{2}{3} \div \frac{3}{4}$. [1]

8. Evaluate (a) 4.8×0.06 , [1]
 (b) $0.003\ 48 \div 0.048$ [2]
 (c) $\sqrt{(\frac{1}{16} \times 4\frac{1}{3}) - (\frac{1}{16} \div 3)}$ [2]
9. (a) Arrange the following in order of magnitude, putting the greatest first:
 $\frac{21}{30}, \frac{8}{11}, \frac{21}{31}, \frac{10}{13}$. [2]
 (b) Simplify $\frac{\frac{1}{4} + \frac{2}{3}}{3\frac{1}{12} - 2\frac{2}{3}}$. [2]
10. (a) Arrange $\frac{21}{55}, 0.6^2, \frac{4}{11}, 0.366$ in ascending order. [2]
 (b) Evaluate $(5 - 0.28 \times \frac{2}{7}) \div (\frac{5}{12} \times 1\frac{1}{5})$. [2]
11. (a) Arrange the following in order of magnitude, putting the smallest first:
 $2.67, 2\frac{11}{16}, 2\frac{2}{3}, 2\frac{3}{5}$ [2]
 (b) Rewrite $\frac{4}{9}$ as a recurring decimal. [1]
 (c) Find the exact value of $\frac{5}{8} \div (\frac{5}{7} \times \frac{7}{16})$. [1]
12. (a) Divide 1.92168 by 62.8. [2]
 (b) Give 52.03604 correct to 4 places of decimals. [1]
 (c) Find the exact value of $\frac{1}{3} \times \frac{22}{7} \times (2\frac{1}{4})^2 \times 1\frac{3}{11}$. [2]
13. (a) Arrange $\frac{9}{20}, \frac{49}{100}, \frac{5}{10}, \frac{12}{25}$ in descending order. [2]
 (b) Evaluate $24.86 + 0.24 \div 6.4$. [2]
 (c) Write 39.6552 correct to 2 decimal places. [1]
14. (a) Express 0.475 as a fraction in its lowest form. [1]
 (b) Simplify $\frac{4\frac{2}{5} - 2\frac{7}{10}}{4\frac{1}{4}} \div \frac{1}{5}$. [2]

15. (a) Find the exact value of $(3.6)^2 \times 0.025$. [1]

(b) Find, as a fraction in its lowest terms, the value of

$$\frac{2\frac{1}{3} - 1\frac{3}{4}}{7} \times \frac{2\frac{2}{5}}{\frac{2}{3} + \frac{3}{5}}. \quad [3]$$

16. Simplify

(a) $1\frac{4}{5} \{ (12\frac{1}{3} \times 9\frac{1}{3}) - (13 \times 8) \},$ [3]

(b) $\frac{0.6}{1.5} + \frac{1.6}{2.5} - \frac{0.37}{1.25}.$ [2]

17. (a) Express $\frac{7}{11}$ as a recurring decimal. [1]

(b) Express 2.36 as an improper fraction in its lowest form. [1]

(c) Calculate the exact value of $2\frac{2}{5} - 0.4 \times 2.2 - \frac{8}{25}.$ [2]

18. (a) Arrange $1.\dot{7}, 1\frac{5}{7}, 1.71, 1\frac{8}{11}$ in ascending order. [2]

(b) (i) Find the exact value of 4.735×0.0086 . [2]

(ii) Express your answer correct to three decimal places. [1]

19. (a) Express as a fraction in its lowest forms $\frac{2\frac{1}{3} - 1\frac{4}{9}}{1\frac{22}{27} - (3 \div 1\frac{4}{5})}.$ [3]

(b) Write down two fractions that are smaller than $\frac{9}{13}$ but bigger than $\frac{8}{13}.$ [2]

20. (a) Write down the next two terms of the sequence $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \dots$ [1]

(b) For the fractions $\frac{1}{3}, \frac{2}{7}, \frac{3}{8}, \frac{5}{15}, \frac{3}{10},$ identify the largest fraction. [2]

(c) Simplify, giving your answer as a fraction in its lowest terms,

$$\frac{(3\frac{5}{12} - 2\frac{1}{4})^2}{3\frac{1}{3} + 2\frac{1}{2}}. \quad [3]$$

21. (a) Find the next two terms of the sequence $\frac{1}{2}, \frac{1}{2}, 1, 1\frac{1}{2}, 2\frac{1}{2}, 4, \dots$. [2]

(b) Evaluate, giving your answer in its lowest terms,

$$\left(\frac{1}{6} \times 10\frac{1}{2}\right) + \frac{3\frac{5}{8} - 1\frac{5}{6}}{1\frac{23}{63}}. \quad [4]$$

22. (a) Find three fractions that lie between $\frac{6}{11}$ and $\frac{7}{11}$. [2]

(b) Evaluate $(2.8^2 + 9.6^2)$. [2]

(c) Simplify $\frac{2\frac{1}{6} + \frac{10}{21}}{3\frac{1}{2} - 2\frac{1}{13}}$. [2]

23. (a) Given that $\frac{1}{2} \text{ m}^3$ of wheat weighs $\frac{5}{16}$ tonnes, find the weight, in tonnes, of $3\frac{1}{5} \text{ m}^3$ of wheat. [2]

(b) A piece of ribbon is $10\frac{3}{8} \text{ m}$ long. If 3 small pieces of ribbon, each of length $2\frac{5}{12} \text{ m}$ are cut off, find the length of the remaining piece. [2]

24. (a) If the result of multiplying a number by $2\frac{2}{3}$ and then dividing the product by $3\frac{1}{2}$ is $\frac{4}{7}$, find the number. [2]

(b) Express as an exact decimal $\frac{1}{4} + \frac{1}{5} + \frac{1}{2 \times 4} + \frac{1}{2 \times 4 \times 5}$. [2]

25. (a) Express $\frac{4}{21}$ as a decimal correct to three decimal places. [2]

(b) Find the value of $\frac{10.8}{0.27}$. [1]

(c) Express 3.325 as a fraction in its lowest terms. [2]

(d) Arrange $\frac{3}{4}, \frac{7}{12}, \frac{5}{8}$ in ascending order. [1]

26. (a) Find the value of $\frac{3}{19}$ of \$228. [1]
- (b) Complete the expression $12\frac{3}{4} \div \frac{2}{5} \div () = 4\frac{1}{4}$. [2]
- (c) When water turns into ice, its volume increases by a fraction of $\frac{1}{11}$. Find the volume of water required to make a piece of ice of volume 1 920 cm³. [2]
27. (a) Complete the following sequence of numbers:
 $\frac{2}{5}, 3\frac{2}{5}, 5\frac{2}{5}, \text{---}, 9\frac{2}{5}, \text{---}$. [2]
- (b) In a school, there are 247 secondary one students. $\frac{4}{19}$ of these students are in class A. Given that 7 more than $\frac{8}{13}$ of the students in this class travel to school by bus, find the number of students in the class who do not travel to school by bus. [3]
28. (a) Complete the following sequence of numbers:
 (i) $\text{---}, \frac{1}{4}, \frac{1}{9}, \text{---}, \frac{1}{25}, \frac{1}{36}$. [1]
 (ii) $1\frac{3}{5}, 1\frac{3}{5}, \frac{4}{5}, \frac{4}{15}, \frac{1}{15}, \text{---}, \text{---}$. [2]
- (b) Simplify $2\frac{1}{24} + 3\frac{15}{84} - 4\frac{3}{56}$. [2]
29. (a) Evaluate $(2\frac{3}{8} - 1\frac{1}{4})^2 \div (1\frac{1}{2} + 1\frac{7}{8})$. [3]
- (b) Find the exact value of $\frac{5.7 \times 2.2}{16.5}$. [2]
30. (a) Calculate (i) $3\frac{1}{4} - 2\frac{3}{8}$, (ii) $3\frac{1}{4} \div 4\frac{7}{8}$. [1]
- (b) Calculate the exact values of
 (i) 1.6×0.128 , [1]
 (ii) $1.6 \div 0.128$. [1]
31. (a) Evaluate $2 \times 3\frac{3}{4} \times (2\frac{1}{3} + 1\frac{8}{15})$. [2]
- (b) Evaluate $15 \times 0.68 - 15 \times 0.036$
 (i) exactly, [1]
 (ii) correct to one decimal place. [1]

32. (a) The average of $1\frac{2}{5}$, $2\frac{7}{10}$ and x is $2\frac{11}{18}$. Find the value of x . [2]

(b) Evaluate exactly $\frac{3.5 \times 4\frac{2}{7} + 9}{4.8 \times 0.5}$. [3]

33. Fill in the brackets () with “>”, “<” or “=”.

(a) $\frac{2}{7} \times \frac{1}{2}$ () $\frac{2}{7}$ [1]

(b) $1\frac{1}{4} \times (\frac{3}{4} - \frac{2}{5})$ () $\frac{7}{17}$ [2]

(c) $\frac{1 + \frac{1}{3} \times 1\frac{3}{4}}{2\frac{1}{2} + \frac{2}{3}}$ () 0.5 [2]

34. Calculate the exact value of

(a) $47 - 0.04$, [1]

(b) 47×0.04 , [1]

(c) $47 \div 0.04$. [1]

35. (a) Find the exact value of $(0.6)^2 \times (4.5)^2$. [2]

(b) Which is the greatest of the three fractions: $\frac{8}{9}$, $\frac{14}{15}$, $\frac{5}{6}$,
and by how much does it exceed the smallest? [2]

36. Fill in the brackets () with “>”, “<”, “=”.

(a) $(0.75 - \frac{3}{4}) \times 21\frac{8}{11}$ () 1 [1]

(b) 3 () $\frac{5.1 - 2\frac{2}{5}}{\frac{1}{2} + 3 \div 7.5}$ [2]

(c) $\frac{3 \div \frac{1}{2} - 4\frac{1}{3}}{3\frac{1}{6} + 1\frac{1}{3}}$ () $\frac{5}{13}$ [2]

37. Use your calculator to evaluate

(a) $66.705 - 20.8485 \div 1.695$, [1]

(b) $(3\frac{5}{9})^2 \div (5\frac{1}{3})^3$. [2]

38. Use your calculator to evaluate each of the following, giving your answer correct to three decimal places.

$$(a) \frac{\frac{4}{5} \times 3.142 \times 15.6}{0.0136 \times 5\frac{4}{9}}, \quad [2]$$

$$(b) 14.697 - 7.842 \times \frac{2.52}{(1.8463)^2}. \quad [2]$$

39. Use your calculator to evaluate each of the following, giving your answer as a fraction.

$$(a) (6\frac{3}{64} + 19\frac{1}{4} - 17\frac{5}{31}) \div 14\frac{2}{5} \quad [2]$$

$$(b) \frac{1\frac{8}{13} \times \frac{13}{42} + 5\frac{1}{5} \div \frac{7}{45}}{(\frac{7}{9} + \frac{7}{18}) \div \frac{1}{18} \times \frac{1}{7}} \quad [3]$$

40. Use your calculator to evaluate each of the following, giving your answer correct to 2 decimal places.

$$(a) \sqrt{\frac{2854.632 \times (29.432)^2}{(45.257)^3}} \quad [2]$$

$$(b) \frac{\sqrt[3]{42.7863} \times (41.567)^2}{94536.721} \quad [2]$$

41. (a) Find the exact value of

$$(i) 1.84 \times 0.092, \quad (ii) \frac{9.8}{1.4 \times 3.5} \quad [2]$$

(b) A rope of length 6.3 metres is cut into two pieces. Given that the length of the longer piece is $\frac{5}{4}$ that of the shorter piece, find the length of the shorter piece.

[3]

$$42. (a) \text{ Evaluate } 1\frac{1}{3} + 3\frac{1}{4} - 2\frac{5}{6}. \quad [1]$$

(b) Arrange (i) $\frac{9}{22}$, 0.4, $\frac{21}{50}$ in ascending order, (ii) 0.55, $\frac{13}{20}$, 0.6 in descending order. [2]

$$(c) \text{ Evaluate (i) } \frac{2.16}{(0.3)^2 \times 0.4}, \quad (ii) 20(\frac{0.75}{0.3} + \frac{0.55}{0.25}) \quad [2]$$

43. Express

(a) \$455.75 correct to the nearest \$10,

- (b) 0.025 4 correct to three decimal places,
 (c) 0.024 as a fraction in its lowest terms,
 (d) $\frac{5}{12}$ as a decimal correct to four decimal places. [4]

44. Express each of the following fractions as decimals. If it is a recurring decimal, write the answer in the appropriate form.

- (a) $\frac{3}{16}$ (b) $\frac{5}{8}$ (c) $\frac{4}{3}$ (d) $\frac{18}{25}$ (e) $\frac{2}{9}$
 (f) $\frac{13}{11}$ (g) $\frac{29}{64}$ (h) $6\frac{5}{12}$ (i) $1\frac{23}{90}$ (j) $\frac{15}{101}$ [10]

45. Arrange each set of numbers in ascending order. [8]

- (a) $0.1\ 87\ 4$, $\frac{3}{16}$, $0.\dot{1}8$, $0.1\dot{8}$ (b) $\frac{7}{5}$, $1.\dot{4}$, 1.04 , $1.\dot{0}8$
 (c) $\frac{1}{26}$, 0.038 , $0.0\dot{3}$, $0.0\dot{3}8$, $0.\dot{0}\ 38$ (d) $\frac{3}{7}$, 0.428 , $0.42\dot{8}$, $0.4\dot{2}8$, $0.42\dot{8}$

46. (a) A man buys 60 baskets of mangosteens. Given that the net weight of mangosteens in each basket is $1\frac{3}{4}$ kg, find the total cost of the mangosteens if they cost \$2.50 per kg. [3]

(b) A man has \$6 300 in his savings account. He withdraws 40% of the money in his savings account and spends $\frac{1}{3}$ of the withdrawal on a television set. How much does he pay for the television set? [3]

47. Mrs. Chen filled the petrol tank of her car before setting off on a trip. She bought petrol twice during the trip. At one stop, she bought 22.8 litres and at another, 24.9 litres. When she returned home from her trip, she found that she needed 15.3 litres to fill the tank to its 40-litre capacity.

- (a) How much petrol did she use on the trip?
 (b) If petrol costs \$1.30 per litre, how much money did she spend on petrol for the trip?
 (c) If she travelled 15.7 km on 1 litre of petrol, what is the total distance travelled? [7]

48. (a) A man earns \$1 000 per month. Find

(i) the fraction of his income spent on food if he spends \$350 per month on food, Give your answer in its lowest terms. [1]

(ii) his savings for a year if he saves $\frac{3}{20}$ of his monthly income. [1]

(b) During a certain class period, 0.125 of the students were studying Literature, 0.15 were studying Geography, 0.235 were studying English, 0.115 were studying Science and the rest were studying Mathematics. How many students were there in all if 240 of them were studying Mathematics? [3]

49. (a) Mr. Lin spent \$20.20 at the market. He bought 4 kg of potatoes at 85 cents per kg, $1\frac{1}{3}$ kg of beef at \$7.80 per kg, and a chicken. How much did the chicken cost?

[3]

- (b) Mrs. Li needs some new curtains which are available in a shop for \$150. If she makes her own, she requires 5.5 m of material costing \$18.50 per metre as well as tape, cotton and others costing \$9.50 altogether. How much will she save if she makes her own curtains?

[3]

50. Calculate the following to 3 decimal places with a calculator.

(a) $\frac{4\ 178}{14.62} \times (0.468\ 2)^3 \times \sqrt[3]{(0.012\ 78)}$

(b) $\sqrt[3]{\frac{(9\ 206 \times (29.5)^3)}{(11.86)^2}}$

(c) $\sqrt{\frac{18 \times (4.359)^2 + 10 \times (3.465)^2}{(4.359)^3 + 3 \times (3.465)^3}}$

(d) $\frac{(15.8)^3 \times (0.093\ 2)^2}{\sqrt[3]{0.067\ 3}} \times \left[\frac{76.25}{8.418} - \frac{8.418}{76.25} \right]$

[8]

51. Evaluate

(a) $4\left(\frac{1}{5} - \frac{1}{2}\right)$,

(b) $-4\frac{1}{3} + 3\frac{1}{2} \times \left(-\frac{1}{6}\right)$ [2]

52. Evaluate $\frac{(-8 \times 5) - 9}{7} + [-45 \div \left(\frac{6-21}{(-3)}\right)]$. [2]

53. Which of these statements are correct? Provide the correct answer to each false statement.

(a) $-\frac{9}{3} = -3$

(b) There is no answer to $\frac{0}{-4}$

(c) $\frac{-4}{0} = -4$

(d) $\frac{65}{-5} = 13$

(e) $\frac{-125}{-25} = 5$

(f) $\frac{-136}{8} = -17$

(g) $[32 \div (-8)] \div (-2) > 32 \div [(-8) \div (-2)]$

[7]

54. Ali poured out $\frac{1}{2}$ of the water in a jar. In the second pouring, he poured out $\frac{1}{3}$ of the remaining water. In the third pouring, he poured out $\frac{1}{4}$ of the remaining water. In the fourth pouring, he poured out $\frac{1}{5}$ of the remaining water and so on. After how many times of pouring will the remaining water be exactly $\frac{1}{10}$ of the original amount of water?

[3]

55. Evaluate (a) $\frac{-15 + [(-18) \div 3]}{6 - [45 \div (-5)]}$, (b) $\frac{(-9) \times [7 - (-2)] + (-9)}{[840 \div (-7)] \div (-4)}$. [4]

56. (a) Evaluate [4]
 (i) $(-7) - (-9)^{-7-(-9)}$, (ii) $(-2) + (-2) \times [(-2)^{-(-2)}]$.
 (b) Which of the following statements is correct? [6]
 (i) $\sqrt{2}$ is equal to 1.41421.
 (ii) $\sqrt[3]{8}$ is an irrational number.
 (iii) π is an irrational number but not a real number.
 (iv) $\sqrt{3}$ is a non-terminating and non-recurring decimal.
 (v) $\frac{3}{4+(-4)}$ is meaningless.
 (vi) $[2 - 3 \times (2 - 3)^2]^3 = 125$.
57. Arrange the following numbers in ascending order. [4]
 (a) $-\frac{3}{2}, -3, 0, -\frac{4}{3}, -2, 1, -\frac{7}{4}, -\frac{5}{3}$ (b) $\sqrt{10}, \frac{22}{7}, \pi, \sqrt{2} + \sqrt{3}$
58. Arrange the following in descending order. [5]
 (a) $(-4) \times \frac{3}{8}$, (b) $\frac{5}{9} \div (\frac{-20}{27})$, (c) $-\frac{1}{3} - \frac{1}{5} - (-\frac{2}{15})$, (d) $3\frac{3}{10} + (-2\frac{1}{5})$
59. $\frac{1}{7}$ of a group of girls scored A for Science; $\frac{1}{3}$ of them scored B; $\frac{1}{2}$ of them scored C and the rest failed. If a total of 100 girls scored A and B, how many girls failed? [3]
60. Use a calculator to compute each of the following and give your answer correct to 2 decimal places. [6]
 (a) $56.8 \times (-6.5) - 68.64 \div (-9.2)$
 (b) $\frac{\sqrt[3]{13} - \sqrt{7}}{\sqrt{48} - \sqrt[3]{101}}$
 (c) $\sqrt{\frac{46.3^2 + 85.9^2 - 70.7^2}{2 \times 46.3 \times 85.9}}$

Answers

1. (a) $6\frac{7}{20}$

(b) $\frac{1}{6}$

2. (a) 17.5

(b) 4

3. (a) 0.57

(b) 53.417 7

(c) $5\frac{1}{5}$

4. (a) 14.732

(b) 3.0

5. (a) 3.6

(b) $\frac{5}{9}$

6. (a) 28.75

(b) 1

7. (a) $\frac{18}{25}$

(b) 0.71

(c) $1\frac{1}{3}$

8. (a) 0.288

(b) 0.0725

(c) $\frac{1}{2}$

9. (a) $\frac{10}{13}, \frac{8}{11}, \frac{21}{30}, \frac{21}{31}$

(b) $2\frac{1}{5}$

10. (a) $0.6^2, \frac{4}{11}, 0.366, \frac{21}{55}$

(b) 9.84

11. (a) $2\frac{3}{5}, 2\frac{2}{3}, 2.67, 2\frac{11}{16}$

(b) 0.4

(c) 2

12. (a) 0.0306

(b) 52.0360

(c) $6\frac{3}{4}$

13. (a) $\frac{5}{10}, \frac{49}{100}, \frac{12}{25}, \frac{9}{20}$

(b) 24.8975

(c) 39.66

14. (a) $\frac{19}{40}$

(b) 2

15. (a) 0.324

(b) $\frac{3}{19}$

16. (a) 20

(b) 0.744

17. (a) $0.\dot{6}\dot{3}$ (b) $\frac{59}{25}$ (c) $1\frac{1}{5}$
18. (a) $1.71, 1\frac{5}{7}, 1\frac{8}{11}, 1.\dot{7}$ (b) (i) 0.040721 (ii) 0.041
19. (a) 6 (b) $\frac{17}{26}, \frac{25}{39}$
20. (a) $\frac{1}{11}, \frac{1}{13}$ (b) $\frac{3}{8}$ (c) $\frac{5}{26}$
21. (a) $6\frac{1}{2}, 10\frac{1}{2}$ (b) $1\frac{3}{4}$
22. (a) $\frac{13}{22}, \frac{19}{33}, \frac{20}{33}$ (b) 10 (c) $1\frac{6}{7}$
23. (a) 2 tonnes (b) $3\frac{1}{8}m$
24. (a) $\frac{3}{4}$ (b) 0.6
25. (a) 0.190 (b) 40 (c) $3\frac{13}{40}$ (d) $\frac{7}{12}, \frac{5}{8}, \frac{3}{4}$
26. (a) \$36 (b) $7\frac{1}{2}$ (c) 1 760
27. (a) $7\frac{2}{5}, 11\frac{2}{5}$ (b) 13
28. (a) (i) $1, \frac{1}{16}$ (ii) $\frac{1}{75}, \frac{1}{450}$ (b) $1\frac{1}{6}$
29. (a) 0.375 (b) 0.76
30. (a) (i) $\frac{7}{8}$ (ii) $\frac{2}{3}$
(b) (i) 0.2048 (ii) 12.5
31. (a) 29 (b) (i) 9.66 (ii) 9.7

32. (a) $3\frac{11}{15}$ (b) 10

33. (a) < (b) > (c) =

34. (a) 49.96 (b) 1.88 (c) 1 175

35. (a) 7.29 (b) $\frac{14}{15}, \frac{1}{10}$

36. (a) < (b) = (c) <

37. (a) 54.405 (b) $\frac{1}{12}$

38. (a) 529.576 (b) 6.900

39. (a) $\frac{2605}{4608}$ (b) $11\frac{13}{42}$

40. (a) 5.16 (b) 19.65

41. (a) (i) 0.169 28 (ii) 2 (b) 2.8 m

42. (a) $1\frac{3}{4}$

(b) (i) $0.4, \frac{9}{22}, \frac{21}{50}$ (ii) $\frac{13}{20}, 0.6, 0.55$

(c) (i) 60 (ii) 94

43. (a) \$460 (b) 0.025 (c) $\frac{3}{125}$ (d) 0.416 7

44. (a) 0.187 5 (b) 0.625 (c) $1.\dot{3}$ (d) 0.72 (e) $0.\dot{2}$

(f) $1.\dot{1}\dot{8}$ (g) 0.453 125 (h) $6.41\dot{6}$ (i) $1.2\dot{5}$ (j) $0.\dot{1}48\dot{5}$

45. (a) $0.\dot{1}\dot{8}, 0.187\ 4, \frac{3}{16}, 0.1\dot{8}$ (b) $1.04, 1.\dot{0}\dot{8}, \frac{7}{5}, 1.\dot{4}$

(c) $0.0\dot{3}, 0.038, 0.\dot{0}3\dot{8}, 0.0\dot{3}\dot{8}, \frac{1}{26}$ (d) $0.428, 0.4\dot{2}\dot{8}, 0.\dot{4}2\dot{8}, \frac{3}{7}, 0.42\dot{8}$

46. (a) \$262.50 (b) \$840

47. (a) 63 litres (b) \$ 81.90 (c) 989.1 km

48. (a) (i) $\frac{7}{20}$ (b) \$1 800 (c) 640

49. (a) \$6.40 (b) \$38.75

50.(a) 6.857 (b) 118.884 (c) 1.492 (d) 753.650

51.(a) $-1\frac{1}{5}$ (b) $-4\frac{11}{12}$

52. -16

53. (a), (e) and (f) are true; (b) $\frac{0}{-4} = 0$;

(c) there is no answer to $\frac{-4}{0}$; (d) $\frac{65}{-5} = -13$;

(g) $[32 \div (-8)] \div (-2) < 32 \div [(-8) \div (-2)]$

54. 9 times

55. (a) $-1\frac{2}{5}$ (b) -3

56. (a) (i) -88 (ii) -10

(b) (iv), (v)

57. (a) $-3, -2, -\frac{7}{4}, -\frac{5}{3}, -\frac{3}{2}, -\frac{4}{3}, 0, 1$ (b) $\pi, \frac{22}{7}, \sqrt{2} + \sqrt{3}, \sqrt{10}$

58. (d), (c), (b), (a)

59. 5

60.(a) -361.74 (b) -0.13 (c) 0.75

Chapter 4

Secondary 1 Mathematics

Chapter 4 Estimation and Approximation

GENERAL NOTES

In this chapter, students will learn about estimation and approximation. It might be a good idea to let them know of the importance and relevance of being able to make quick and good estimations. They are likely to encounter the use of estimation and approximation in their daily lives.

As an introductory lesson to this chapter, you may like to ask your students to estimate the weight and height of their friends using their own weight and height as a reference. Other items which they can estimate are: the height of their school building, the height of a tree, the number of grains in 1 kg of rice, etc.

You may wish to point out to your students that measurement involving counting is exact, for example, there are 42 students in a class, 10 pencils cost \$1.25 and so on. On the other hand, measures of height, weight, length and so on are only approximate. The degree of accuracy of such measurements depends on the type of measuring instruments used and the person doing the measurement. The Exploration on page 73 of the textbook is designed to reinforce this point.

Reminder

You may like to remind your students

- (1) not to do rounding off before the end of the calculation if they are asked to give the answer in a rounded form. e.g. $6.34 + 3.23 = 9.57 = 9.6$ (correct to 2 significant figures)

$$\text{not } 6.34 + 3.23 = \underbrace{6.3 + 3.2}_{\text{do not round off prematurely}} = 9.5;$$

do not round off prematurely

- (2) that the first significant figure of 0.04218 is 4, not 0 and thus 0.04218, correct to two significant figures, is 0.042 and not 0.04;
- (3) that the first two significant figures of 2.01479 are 2 and 0, not 2 and 1 and thus 2.01479, correct to four significant figures, is 2.015, not 2.0148;
- (4) that 4.398, correct to three significant figures, is 4.40, not 4.4;
(Note: Do not confuse number of decimal places with number of significant figures.)
- (5) to do rounding off at the very end of the calculation and work to one more significant figure than you are required to give. For example, use four significant figures until the end of your calculations if the final answer is to be given to three significant figures;
- (6) not to give an answer to too many decimal places or significant figures. For example, if your calculator shows 6.326579438, give your answer as 6.33 or 6.327, not 6.326579438;

The concept of absolute errors is new and many students wonder why a figure of 12 can be from 11.5 to 12.5 and not from 11.5 to 12.4 as taught earlier at primary level. The following examples may be useful to illustrate this point. If you obtain 74.5 in a test and I have to round the mark off to the nearest whole number which is 75, I am making an

error of 0.5. If I give you 74, I am making the same error of 0.5. Since I'll be making the same error whether I give you 74 or 75, I may take other things into consideration, like your work attitude to decide whether to give you the extra mark, etc.

If you have \$45 in your pocket and your friends ask you how much you have, you can say \$50 if you want others to think that you are rich. If you do not want others to know that you have a lot of money, you can say you have \$40. If your friends say that those with the most money in their pockets should give the rest a treat, what would you tell your friends regarding the amount of money you have?

At an informal party, only those who are 15 years old can take part in a guessing game. Say on that day you are exactly 14 years 6 months, would you be considered eligible for the game? If you are exactly 17 years 6 months and the entry requirement is aimed at people 17 years or below, how would you argue your way into participating in the game?


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks: 

Secondary 1 Multiple-Choice Questions Chapter 4 Estimation and Approximation

- $\frac{29.29 \times 1.91}{5.08 \times 19.4} \approx$ _____.
(A) 0.5 (B) 0.6 (C) 0.7 (D) 0.8 (E) 0.9 ()
- If a papaya weighs approximately 510 grams, the approximate number of papayas in a box weighing 19.5 kg is _____.
(A) 35 (B) 40 (C) 45 (D) 50 (E) 55 ()
- The sides of a rectangle are 12 cm and 17 cm, measured to the nearest cm. The smallest possible perimeter of the rectangle, in cm, is given by _____.
(A) $(11.5 + 16.5)$ (B) $(12.5 + 17.5)$ (C) $2(11.5 + 17.5)$
(D) $2(16.5 + 12.5)$ (E) $2(16.5 + 11.5)$ ()
- The largest possible area of the rectangle is _____ cm^2 .
(A) 204 (B) 218.75 (C) 210 (D) 201.25 (E) 205.45 ()
- The best estimate of the area of a triangle whose base is 7.97 m and whose height is 10.15 m is _____ m^2 .
(A) 36 (B) 38 (C) 40 (D) 42 (E) 44 ()
- Express 2 344.682 8, correct to 3 significant figures.
(A) 2 344 683 (B) 2 350 (C) 2 340
(D) 235 (E) 234 ()
- Express 2 314 000 correct to the nearest 10 000.
(A) 2 320 000 (B) 2 310 000 (C) 2 300 000
(D) 231 400 (E) 23 140 ()
- What is the best estimate of $\frac{\pi(8.5^2 - 7.5^2) \times 26}{169.8}$?
(A) 0.08 (B) 0.8 (C) 8 (D) 80 (E) 800 ()
- Calculate 21.6×9.42 to 4 significant figures.
(A) 203.50 (B) 203.5 (C) 203.47 (D) 203.4 (E) 202.5 ()

10. Calculate $139.06 + 52.0085 - 26.004$ to 2 decimal places.

- (A) 165.06 (B) 165.07 (C) 165.10 (D) 170 (E) 217.07 ()

Answers

- | | | | | |
|------|------|------|------|-------|
| 1. B | 2. B | 3. E | 4. B | 5. C |
| 6. C | 7. B | 8. C | 9. B | 10. A |


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks: 

Secondary 1 Mathematics Test Chapter 4 Estimation and Approximation

1. Write down the value of 17.049 correct to
 - (a) one significant figure, [1]
 - (b) one decimal place. [1]
2. Express, correct to 2 significant figures,
 - (a) 368.517, [1]
 - (b) 0.060 486. [1]
3. Express, correct to 3 significant figures,
 - (a) 4.718 5, [1]
 - (b) 376 490, [1]
 - (c) 0.003 895 2. [1]
4. Express 403.97 correct to (a) 1 decimal place, [1]
(b) 2 significant figures. [1]
5. Evaluate $80\frac{1}{4} - 5.4 \div 10$, giving your answer correct to
 - (a) 2 decimal places, [1]
 - (b) 3 significant figures. [1]
6. Express 578.093 8 correct to
 - (a) 4 significant figures, [1]
 - (b) the nearest 100, [1]
 - (c) 2 decimal places, [1]
 - (d) the nearest thousandth. [1]
7. Calculate $38.39 + 37.69 - 42.84$, rounding off to
 - (a) 1 decimal place, [1]
 - (b) 2 significant figures. [1]
8. Write 904.961 correct to (a) the nearest whole number, [1]
(b) three significant figures, [1]
(c) two decimal places. [1]

9. (a) Express 0.000 784 6 correct to 2 significant figures. [1]
 (b) Estimate the value of the following, giving the answer to one significant figure. [1]
 (i) 30.9×98.6 [1]
 (ii) $\frac{49.82}{9.784}$ [1]
10. Round off (a) 0.056 75 to 3 decimal places, [1]
 (b) 4.952 to 2 significant figures, [1]
 (c) \$34 597 124 to the nearest \$100 000. [1]
11. (a) Which of the following is nearest in value to $\sqrt{916}$? [1]
 (i) 10 (ii) 100 (iii) 30 (iv) 300
 (b) Which of the following is nearest in value to $\frac{6.01 \times 0.0312}{0.0622}$? [1]
 (i) 0.03 (ii) 0.3 (iii) 3 (iv) 30
 (c) Which of the following is nearest in value to $4\,925.7 \times 226.38$? [1]
 (i) 10 000 000 (ii) 1 000 000 (iii) 100 000 (iv) 10 000
12. (a) Express 418.005 correct to 5 significant figures. [1]
 (b) Which of the following is nearest in value to $\sqrt[3]{8\,243}$? [1]
 (i) 200 (ii) 900 (iii) 20 (iv) 90
 (c) Which of the following is nearest in value to $\frac{312.8 \times 61.6}{58.4 \times 2980}$? [1]
 (i) 0.01 (ii) 0.1 (iii) 1 (iv) 10 [2]
13. (a) Express 0.004 57 correct to 2 significant figures. [1]
 (b) Which of the following is nearest in value to $\sqrt[3]{1\,111.9}$? [1]
 (i) 100 (ii) 30 (iii) 300 (iv) 10
 (c) Which of the following is nearest in value to $\frac{49.9}{0.0101} + \frac{110 - 70.15}{3991}$? [1]
 (i) 5000.01 (ii) 5000.1 (iii) 500.01 (iv) 500.1 [3]
14. (a) Estimate the value of $\frac{12.01 \times 4.8}{2.99}$ to one significant figure. [2]
 (b) Using your result in (a), estimate the value of $\frac{12.01 \times 0.048}{0.299}$, correct to one significant figure. [3]
15. (a) Estimate $1\,793 \times 0.000\,979$ correct to 1 decimal place. [1]
 (b) Express 0.052 639 81 correct to 5 significant figures. [1]
 (c) Estimate $\frac{31.205 \times 4.97}{1.925}$ correct to one significant figure. [2]

16. Estimate, correct to 1 significant figure, the value of
- (a) $61.994\ 06 - 29.980\ 78$ [1]
- (b) $\frac{81.09}{1.592}$ [1]
17. Estimate, correct to 1 significant figure, the value of
- (a) $(8.907)^2$, [1]
- (b) $\frac{59.701+41.098}{\sqrt[3]{998.07}}$. [2]
18. Estimate, correct to one significant figure, the value of
- (a) $\sqrt{\frac{35.807}{101.09}}$, [2]
- (b) $\frac{4.18 \times 0.0309}{0.0212}$, [2]
- (c) $\frac{3909}{20390}$. [1]
19. Estimate, correct to one significant figure, the value of
- (a) $\frac{83.5}{0.0419}$, [1]
- (b) 9801×0.0613 , [1]
- (c) $\sqrt{\frac{18.01 \times 36.01}{1.989}}$. [3]
20. (a) Express, correct to 2 significant figures,
- (i) 349.614, [1]
- (ii) 0.020 285. [1]
- (b) Hence estimate, correct to 1 significant figure, the value of $349.614 \times 0.020\ 285$. [1]
21. (a) Express, correct to 2 significant figures,
- (i) 24.988, [1]
- (ii) 39.681 7, [1]
- (iii) 198.97, [1]
- (b) Hence estimate, correct to 1 significant figure, the value of $\frac{\sqrt{24.988 \times 39.6817}}{198.97}$. [2]
22. (a) Estimate $\frac{(0.98452)^3 \times \sqrt{2\ 525}}{102.016}$ correct to 1 significant figure. [2]
- (b) Use your calculator to find the value of $\frac{(0.98452)^3 \times \sqrt{2\ 525}}{102.016}$ correct to 3 significant figures. [2]

23. (a) Express (i) 271.569 correct to 2 significant figures, [1]
(ii) 9.906 8 correct to the nearest whole number, [1]
(iii) 3.019 8 correct to 1 decimal place. [1]
- (b) Hence estimate $\frac{271.569 \times (9.9068)^2}{(3.0198)^3}$ correct to 1 significant figure. [2]
- (c) Use your calculator to find the value of $\frac{271.569 \times (9.9068)^2}{(3.0198)^3}$, giving your answer correct to 2 significant figures. [2]
24. Use a calculator to evaluate the following, giving the answers to 5 significant figures
- (a) $\frac{8.452 \times 0.914}{1.469}$ [2]
- (b) $\sqrt[3]{\left(\frac{11.84 \times 0.871}{0.9542}\right)}$ [2]
25. Use a calculator to evaluate, giving the answers to 5 significant figures.
- (a) $\frac{45.729}{1.74 \times 3.86} - \frac{1}{0.6421}$ [2]
- (b) $\frac{(0.629)^2 - \sqrt{7.318}}{2.873}$ [2]
26. Evaluate the following using a calculator and give your answers correct to significant figures.
- (a) $\sqrt[3]{\frac{(1.92)^2}{(4.3)^3 - \sqrt{4.788}}}$ [2]
- (b) $\frac{7.295 - \sqrt{7.295}}{(7.295)^2} + \frac{(6.98)^3 - 6.98}{\sqrt[3]{6.98}}$ [3]
27. (a) Estimate the value of $\frac{9.02}{2.98}$ to one significant figure.
- (b) Use your result in (a) to estimate the value of $\frac{9.02}{0.298}$ [2]
28. (a) Express 0.006 45 correct to two significant figures.
- (b) Estimate, correct to 1 significant figure, the value of $64.967\ 02 - 36.230\ 87$. [2]
29. (a) Write down the value of 27.049 correct to
(i) one significant figure,
(ii) one decimal place.
- (b) Estimate the value of $\frac{85.12}{1.69}$, giving your answer correct to one significant figure. [3]

30. A box contains five bags of sugar. Each bag of sugar has a mass of 540 g, correct to the nearest gram. The box has a mass of 70g, correct to the nearest gram. Find the largest possible value of
- the mass of 1 bag of sugar,
 - the total mass of the 5 bags of sugar and the box. [3]
31. Find the approximate value of the expression, $\frac{49.98 \times \sqrt{36.02}}{24.97}$, giving your answer correct to the nearest 10. [2]
32. (a) Express 5 972 cm in metres, giving your answer correct to the nearest metre.
 (b) What is \$645.90 correct to the nearest \$10?
 (c) Write down (i) 0.004 197 correct to 3 significant figures.
 (ii) correct to the nearest whole number, the value of $\sqrt[3]{998}$. [4]
33. Estimate
- correct to 2 significant figures, the value of $15.002 \div 0.019\ 99 - 68.12$.
 - correct to 1 significant figure, the value of $\sqrt[3]{\frac{79.97 \times 24.999}{2.003}}$.

Answers

- | | | |
|-----------------|--------------|------------------|
| 1. (a) 20 | (b) 17.0 | |
| 2. (a) 370 | (b) 0.060 | |
| 3. (a) 4.72 | (b) 376 000 | (c) 0.003 90 |
| 4. (a) 404.0 | (b) 400 | |
| 5. (a) 80.20 | (b) 80.2 | |
| 5. (a) 80.20 | (b) 80.2 | |
| 7. (a) 33.2 | (b) 33 | |
| 8. (a) 905 | (b) 905 | (c) 904.96 |
| 9. (a) 0.00078 | (b) (i) 3000 | (ii) 5 |
| 10. (a) 0.057 | (b) 5.0 | (c) \$34 600 000 |
| 11. (a) (iii) | (b) (iii) | (c) (ii) |
| 12. (a) 418.01 | (b) (iii) | (c) (ii) |
| 13. (a) 0.004 6 | (b) (iv) | (c) (i) |
| 14. (a) 20 | (b) 200 | |
| 15. (a) 1.8 | (b) 0.052640 | (c) 80 |
| 15. (a) 1.8 | (b) 0.052640 | (c) 80 |
| 17. (a) 80 | (b) 10 | |
| 18. (a) 0.6 | (b) 6 | (c) 0.2 |
| 19. (a) 2 000 | (b) 600 | (c) 20 |
| 20 (a) (i) 350 | (ii) 0.020 | (b) 7 |
| 21. (a) (i) 25 | (ii) 40 | (iii) 200 |
| | | (b) 1 |
| 22. (a) 0.5 | (b) 0.470 | |

23. (a) (i) 270 (ii) 10 (iii) 3.0 (b) 1000 (c) 970

24. (a) 5.259 (b) 2.211

25. (a) 5.2511 (b) -0.80388

26. (a) 0.363 (b) 174

27. (a) 3 (b) 3 000

28. (a) 0.006 5 (b) 30

29. (a) (i) 30 (ii) 27.0 (b) 50

30. (a) 540.5 g (b) 2 773 g

31. 10

32. (a) 60 m (b) \$650 (c) (i) 0.004 20 (ii) 10

33. (a) 680 (b) 10

Chapter 5

Secondary 1 Mathematics

Chapter 5 Fundamental Algebra

GENERAL NOTES

Although algebra was introduced in primary schools, students generally find this topic very difficult to grasp. It is advisable to start afresh and introduce it from the fundamentals. Exercise 5a, No. 5 involves manipulation with integers and provides good practice for students dealing with negative numbers.

To prepare students well for the next few topics on algebra, the practice on translating word expressions to algebraic expressions should be given extra emphasis. Worked examples 1, 2 and 3 plus Exercise 5a Nos. 3, 4, 6 and 7 are useful for this purpose.

Many students find algebra difficult and abstract whereas many others find it irrelevant in most practical cases. You may like to give a brief description of the origin of algebra and its uses in other branches of mathematics and science.

Algebra is a generalisation of arithmetic. It gives compact formulae or generalisations to be used in all cases. It provides an effective way of expressing complicated relations and many scientific truths are generalised into simple and compact formulae. Algebra is a good approach used for the study of abstract mathematics and inculcates the power of analysis. Most importantly, it is a very good instrument for students to train their minds and progress to a higher level of learning. Students will learn how to recognise, identify and associate particular cases and elements to the general types to which they belong.

Common Errors Made By Students

1. $(2a)^3 = 2a^3$
2. $2x - 3(x - y) = 2x - 3x - 3y = -x - 3y$
3. $\frac{3x+y}{4} - \frac{x-y}{4} = \frac{3x+y-x-y}{4} = \frac{2x}{4}$
4. If $a = 2$, $b = -3$ and $c = 5$, then $2ac - 4b^2 = 2 \times 2 \times 5 - 4 \times (-3)^2 = 20 + 36 = 56$
5. $3x \times 2x = 6x$

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

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10

Secondary 1 Multiple-Choice Questions Chapter 5 Fundamental Algebra

1. If $x = -4$, then the value of $2x^2$ is _____.
 (A) -64 (B) -32 (C) 32 (D) 64 (E) 128 ()

2. $2a + 5b - 3c - (4b - 3a + 6c) =$ _____.
 (A) $5a + b + 9c$ (B) $-5a + b + 9c$ (C) $5a - b + 9c$
 (D) $5a - b - 9c$ (E) $5a + b - 9c$ ()

3. $[2a - b(a + 3)] + b(3 + 2a) =$ _____.
 (A) $2a + ab$ (B) $2ab + b^2$ (C) $b(2 + a)$
 (D) $2(a - b)$ (E) $2a + 2ab$ ()

4. If $x = -1$ and $y = 3$, evaluate $\frac{x^2 - xy}{y}$.
 (A) -2 (B) $-\frac{2}{3}$ (C) 0 (D) $1\frac{1}{3}$ (E) 2 ()

5. If $x = -2$, $y = -1$ and $z = 0$, then $(x - y)^{z-x}$ is _____.
 (A) 9 (B) 1 (C) -1 (D) $\frac{1}{9}$ (E) $-\frac{1}{9}$ ()

6. $5x - (-2x) - x =$ _____.
 (A) $2x$ (B) $4x$ (C) $6x$ (D) $8x$ (E) $9x$ ()

7. Subtract $7x^3 - x^2 + 3x + 3$ from $4x^3 + 2x^2 - 5x + 1$.
 (A) $-3x^3 - 3x^2 + 8x + 2$ (B) $3x^4 + 3x^3 + 8x^2 + 2$ (C) $3x^2 + 2x^2 - 6x - 2$
 (D) $-3x^3 + 3x^2 - 8x - 2$ (E) $-3x^3 + x^2 - 8x - 1$ ()

8. Simplify $\frac{1}{x} + \frac{1}{2x} + \frac{1}{3x}$.
 (A) $\frac{1}{2x}$ (B) $\frac{1}{6x}$ (C) $\frac{5}{6x}$ (D) $\frac{11}{6x}$ (E) $\frac{1}{6x^3}$ ()

9. If $x = 2$, then the value of $(x^x)^{(x^x)} + \frac{1}{x}$ is _____.

- (A) $16\frac{1}{2}$ (B) $64\frac{1}{2}$ (C) $256\frac{1}{2}$ (D) $1\,024\frac{1}{2}$ (E) $65\,536\frac{1}{2}$ ()

10. If $a = 2$, $b = 3$ and $c = 1$, which of the following is incorrect?

- (A) $2a + 3b + c = 15$ (B) $3a + 3b + 2c = 17$ (C) $a + b + c = 6$
(D) $a + 2b + 3c = 11$ (E) $3a + 2b + 2c = 14$ ()

Answers

- | | | | | |
|------|------|------|------|-------|
| 1. C | 2. E | 3. A | 4. D | 5. B |
| 6. C | 7. D | 8. D | 9. C | 10. A |

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks:

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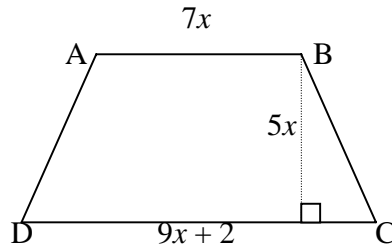
Secondary 1 Mathematics Test Chapter 5 Fundamental Algebra

1. Given a number k , add 8 to it, multiply the sum by 5 and subtract $(2k - 1)$ from the result. Write the resulting number in terms of k . [2]
2. Given that $x = 3$, $y = -4$, evaluate $2y^2 - y(x - y)$. [2]
3. Simplify (a) $7a^2 - 4a - 5a(a - 3) + 4(a - 5)$, [2]
(b) $8a - \{2a - [3c - 6(a - 2c)]\}$. [2]
4. (a) Subtract the sum of $(3a^2 + 5a - 4)$ and $(a^3 - 5a^2 + 8)$ from $7a^3 - 4a^2 - 9$. [3]
(b) Simplify $\frac{x}{5} - \frac{4}{3x}$. [2]
5. (a) Subtract $a^3 - 3a^2 - 5a + 5$ from $4a^3 - 2a + 7$. [2]
(b) Simplify $8\sqrt{a^2c^4 \div \sqrt{4c^2} \times \frac{a}{c}}$. [3]
6. If $a = -2$ and $b = -5$, find the value of $-5a - (-2b) + 3$. [2]
7. Simplify the following algebraic expressions.
(a) $h \times 2kh \times (-2h)^2$ [1]
(b) $2a - 5(3ab - 4b) - 2(a - 2ba)$ [2]
8. Simplify $3x - \{2x - 4(x - 3y) - [(3x - 4y) - (y - 2x)]\}$. [3]
9. Simplify (a) $3a^2 + 5a - 2(a - 2a^2)$, [1]
(b) $2a \times 5a$. [1]
10. If $a = 4$, $m = -2$ and $n = -1$, evaluate the following.
(a) $4m^2 - 3a - 5n$ [2]
(b) $7n + 3\frac{3}{4}a - (m - a)$ [2]
11. State whether each of the following statements is true (T) or false (F).
(a) $2 \times (a - b) = 2a - 2b$
(b) $(-2a)^2 = 2a^2$
(c) $5 \times (2a)^3 = 10a^3$
(d) $(-2a) \times (3a) > (-4a) \times (-a)$ [4]

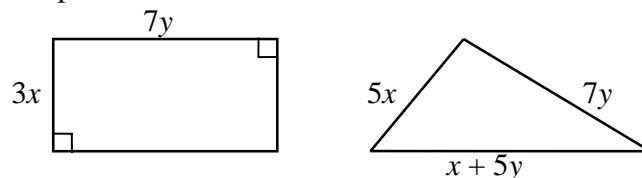
12. Simplify (a) $7m - 2[6m - (3m - 4p)]$, [2]
 (b) $10x^2 + 5x - 7 - (3x^2 - 2x - 11)$. [2]
13. Simplify (a) $\frac{x+5}{3} - \frac{2x-7}{6} + \frac{x}{2}$ [2]
 (b) $\frac{3x-7}{2} - \frac{x+4}{5} - \frac{3}{4}$ [3]
14. Simplify $5(2x - 7y) - 4(y - 3x)$. [2]
15. Simplify $12a - 3\{a - 4[c - 5(a - c)]\}$ [2]
16. If $5x = y^2 - \frac{y^3}{z}$, find the value of x when $y = -3$ and $z = -1\frac{1}{2}$. [3]
17. Given that $a = 2$, $c = -1$, $d = 5$ and $e = -4$, find the value of
 (a) $a - c(d - e)$, [2]
 (b) $\frac{2e - a}{c^2 - de}$. [2]
18. What must be added to $(3 - 4x + 5x^2)$ to give $(9x^2 + 11x - 13)$? [2]
19. From what polynomial must $(2x^2 + 5x - 7)$ be subtracted to give $(5x - 3x^2 + 9)$? [3]
20. Simplify $\frac{2(3x-1)}{5} - (x-3) - \frac{2x+1}{3}$. [3]
21. Simplify the following expressions:
 (a) $\frac{x+y}{3} - \frac{2}{5} - \frac{3x-2y}{6}$ [2]
 (b) $4(x-5y) - 5(2y-3x) - (2x-5y)$ [2]
22. Simplify (a) $\frac{2(5x-1)}{3} - \frac{x-3}{5}$ [2]
 (b) $\frac{5}{2x} - \frac{3}{3x} + \frac{7}{x}$ [2]
23. Simplify (a) $3a + 5ac - 2c - 4c - 6a - 8ca$, [2]
 (b) $\frac{a}{5} - \frac{2(3a-5c)}{6}$ [3]
24. Given that x is an odd number, find the sum of the next three consecutive odd numbers in terms of x . [2]
25. John buys x apples at $(y + 3)$ cents each. He sells them at $(2y - 5)$ cents each. Find his profit in terms of x and y . [3]

26. A merchant buys n microchips at $\$2x$ and sells them at $\$(n - x)$ each. If the merchant suffers a loss after selling all the microchips, express his loss in terms of n and x . [3]

27. The figure shows a trapezium ABCD. Find an expression for the area ABCD in terms of x . [3]



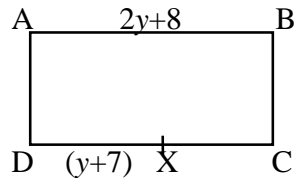
28. There are four consecutive even numbers and the second number is denoted by n .
 (a) Express all the four numbers in terms of n .
 (b) Find the sum of the four numbers in terms of n . [4]
29. Samy has n coins. x of them are 10-cent coins, $3x$ of them are 20-cent coins and the remaining coins are 50-cent coins. Express in terms of n and x ,
 (a) the number of 50-cent coins that Samy has,
 (b) the total value of all the coins. [4]
30. Which of the two figures has a greater perimeter, the rectangle or the triangle? Give a simple explanation. [3]



31. A shopkeeper buys 120 apples at h cents each and 180 oranges at k cents each. He packs them into bags which contain 2 apples and 3 oranges and sells each bag of fruit for $(3h + 4k)$ cents each. Express in terms of h and k the amount in dollars that
 (a) he spent on the fruit, [2]
 (b) he received from all the bags of fruit, [2]
 (c) he will make after selling all the fruit. [2]

32. ABCD is a rectangle with $AB = (2y + 8)$ cm. X is a point on DC such that $DX = (y + 7)$ cm. Given that the perimeter of ABCD is 60 cm, express the following in terms of y :

(a) AD (b) XC [3]



33. The average age of $(m + 2)$ boys and $(n + 5)$ girls is p years old. If the average age of the girls is q years old, find an expression for the average age of the boys. [4]

34. Jackie is now five times as old as Ming. If the sum of their ages in 5 years' time is x , express Ming's age in terms of x . [3]

35. Simplify:

- (a) $2(3x - 5) - 3(7 - 4x)$,
 (b) $\frac{x+3}{5} - \frac{1-x}{2}$,
 (c) $\frac{3x+4}{10} - \frac{x+7}{15} - \frac{2x-1}{5}$. [6]

36. (a) Find the value of $\frac{x-5}{x+7} - 3x^2$ when $x = -2$. [2]

- (b) Evaluate $\frac{3a^2bc}{2b-3c} - \frac{bc}{a}$ when $a = 2$, $b = -3$, $c = -4$. [3]

37. (a) Simplify $\frac{2x-3}{5y} - \frac{5-2x}{10y} + \frac{x}{y}$. [3]

- (b) Given that $a = -2$, $b = 3$ and $c = -5$, find the value of $(2a + b - c)^2$. [2]

38. Simplify:

- (a) $2(x^2 - 5x) - 7(x - x^3 + x^2 - 1)$,
 (b) $\frac{2x-5}{3} + \frac{x+4}{6} - \frac{5-x}{9}$,
 (c) $7x - [3x - \{4x - 2(x + 3y)\}]$. [6]

39. What must be added to $3x^3 - 4x^2 + 2x - 5$ to give $12 - 4x + 7x^2 + 4x^4$? [2]

40. Simplify:

(a) $8x^3y^4 \div 2\frac{2}{5}xy$,

(b) $\frac{3x^2y \times (-2x^2y^2)^2}{(-xy^2)^3}$. [4]

41. Subtract $2x^3 - 4x^2 + 7$ from the sum of $(3x^3 + 4x - 5)$ and $(2 - 7x^3 + 4x^2)$. [3]

42. Subtract from $2x^4 - 3x^2 + 5$ from $7x^3 - 4x + 7$ and add the result to $4x^4 + 3x^3 - 2x^2 + x + 15$. [3]

43. If $a = 2$, $b = -1$, $c = 0$ and $d = \frac{1}{2}$, evaluate:

(a) $(2a - b)^2$, [1]

(b) $(3a - b)(2c + d)$, [2]

(c) $(5a - b)(2c + d) - b(ab + bc - 4cd)$. [2]

44. Simplify:

(a) $\frac{1}{2}[14x - \frac{2}{3}(9x - 21y) - 2(x + y)]$, [2]

(b) $\frac{3x - 4y}{6} + \frac{x - 2y}{4} - \frac{2(x + y)}{5}$. [2]

45. Given that $\frac{x + 5y}{5x - 7y} = \frac{1}{4}$, find the value of x when $y = -3$. [3]

46. Factorise each of the following.

(a) $3ac - ad + 2bd - 6bc$

(b) $2ac - 4ad + 6d - 3c$

(c) $2x + ax - 6y - 3ay$

(d) $2ac - 2c + 5ad - 5d$

(e) $4ab - 2ay + 4bx - 2ay$

(f) $6ab - 3ad + cd - 2bc$

(g) $3xy - 4y - 12b + 9bx$

(h) $12ac + 2b - 8c - 3ab$

(i) $3by - 6bx + 2ax - ay$

(j) $3xa + 15bx - 10yb - 2ay$ [20]

Answers

1. $3k + 41$

2. 60

3. (a) $2a^2 + 15a - 20$ (b) $15c$

4. (a) $6a^3 - 2a^2 - 13$ (b) $\frac{3x^2 - 20}{15x}$

5. (a) $3a^3 + 3a^2 + 3a + 2$ (b) $4a^2$

6. 3

7. (a) $8kh^4$ (b) $20b - 11ab$

8. $10x - 17y$

9. (a) $7a^2 + 3a$ (b) $10a^2$

10. (a) 9 (b) 14

11. (a) T (b) F (c) F (d) F

12. (a) $m - 8p$ (b) $7x^2 + 7x + 4$

13. (a) $\frac{3x + 17}{6}$ (b) $\frac{26x - 101}{20}$

14. $22x - 39y$

15. $72c - 51a$

16. - 9

17. (a) 11 (b) $-\frac{10}{21}$

18. $4x^2 + 15x - 16$

19. $10x - x^2 + 2$

20. $\frac{34 - 7x}{15}$

21. (a) $\frac{-5x + 20y - 12}{30}$ (b) $17x - 25y$

22. (a) $\frac{47x-1}{15}$

(b) $\frac{17}{2x}$

23. (a) $-3a - 6c - 3ac$

(b) $\frac{25c-12a}{15}$

24. $3x + 9$

25. $xy - 8x$

26. $n^2 - 3nx$

27. $40x^2 + 5x$

28. (a) $n-2, n, n+2, n+4$ (b) $4n+4$

29. (a) $n-4x$ (b) $(50n-130x)$

30. rectangle, as $6x + 14y$ is greater than $6x + 12y$ and y is positive.

31. (a) $\$(1.2h + 1.8k)$

(b) $\$(1.8h + 2.4k)$

(c) $\$(0.6h + 0.6k)$

32. (a) $22 - 2y$ (b) $y + 1$

33. $\frac{p(m+n+7)-q(n+5)}{(m+2)}$

34. $\frac{x-10}{6}$

35. (a) $18x - 31$

(b) $\frac{7x+1}{10}$

(c) $\frac{4-5x}{30}$

36. (a) $-13\frac{2}{5}$

(b) 18

37. (a) $\frac{16x-11}{10y}$

(b) 16

38. (a) $7x^3 - 5x^2 - 17x + 7$ (b) $\frac{17x-28}{18}$

(c) $6x - 6y$

39. $4x^4 - 3x^3 + 11x^2 - 6x + 17$

40. (a) $\frac{10x^2y^3}{3}$

(b) $\frac{-12x^3}{y}$

41. $-6x^3 + 8x^2 + 4x - 10$

42. $2x^4 + 10x^3 + x^2 - 3x + 17$

43. (a) 25 (b) $3\frac{1}{2}$ (c) $3\frac{1}{2}$

44. (a) $3x + 6y$ (b) $\frac{21x - 94y}{60}$

45. $x = -81$

46. (a) $(a - 2b)(3c - d)$
(b) $(c - 2d)(2a - 3)$
(c) $(x - 3y)(2 + a)$
(d) $(2c + 5d)(a - 1)$
(e) $2(a + x)(2b - y)$
(f) $(3a - c)(2b - d)$
(g) $(3x - 4)(y + 3h)$
(h) $(2 - 3a)(b - 4c)$
(i) $(a - 3b)(2x - y)$
(j) $(3x - 2y)(a + 5b)$

Chapter 6

Secondary 1 Mathematics

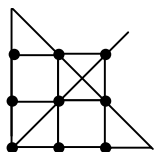
Chapter 6 Number Sequences

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 118)

63, 46 Square each term of the sequence 1, 2, 3, 4, 5, ... and write down the result with the digits reversed.

Just For Fun (pg 128)



Just For Fun (pg 129)

Use 6 matchsticks to form a tetrahedron to obtain 4 equilateral triangles.

Just For Fun (pg 132)

3 1 1 3 1 1 2 2 2 1 1 3

There are three 1's, one 3, one 1, two 2's, two 1's, one 3 in the previous line.

Secondary 1 Mathematics

Chapter 6 Number Sequences

GENERAL NOTES

The following sequences may be used to arouse students' interest and to illustrate that a sequence and its rules can be formulated at will.

```

      1
    1 1
  2 1
1 2 1 1
1 1 1 2 2 1
3 1 2 2 1 1
1 3 1 1 2 2 2 1
1 1 1 3 2 1 3 2 1 1
      (i)
  
```

```

      2
    1 2
  1 1 1 2
  3 1 1 2
1 3 2 1 1 2
1 1 1 3 1 2 2 1 1 2
3 1 1 3 1 1 2 2 2 1 1 2
1 3 2 1 1 3 2 1 3 2 2 1 1 2
      (ii)
  
```

The rule for (i) is: start by writing down one 1 in row 1. Because there is one 1 in row 1, write 1 1 for row 2. Since there are two 1's in row 2, write 2 1 for row 3. Write 1 2 1 1 for row 4 since there is one 2 and one 1 in row 3 and so on. The rule for (ii) is similar to that for (i). You may use (i) for a lesson in one class and (ii) for another class. You may want your students to come up with their own sequences too.

The sequence given on page 118 under "Just For Fun" may prove to be interesting enough to set the students thinking.

The problem of rabbit breeding on page 45 that leads to the Fibonacci sequence on page 47 is another interesting example for students to investigate.

Problem-solving strategies are important tools for Mathematics and a host of other disciplines. It will expose students to the various methods of viewing a problem and tackling it from different angles. Let students try their hands at solving non-routine problems, as they would feel immensely satisfied after having solved difficult sums.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks:

10

Secondary 1 Multiple-Choice Questions Chapter 6 Number Sequences

1. 1, 3, 4, 7, 11, (), 29, 47,
(A) 15 (B) 16 (C) 17 (D) 18 (E) 19 ()

2. 45, 55, 66, 78, (), 105, 120,
(A) 87 (B) 88 (C) 89 (D) 90 (E) 91 ()

3. 4, 12, 36, 108, (), 972, 2 916,
(A) 144 (B) 216 (C) 324 (D) 432 (E) 864 ()

Find the next two numbers in each of the following sequences.

4. 14, 17, 23, 32,
(A) 44, 59 (B) 35, 41 (C) 38, 44 (D) 36, 37 (E) 50, 59
()

5. 2, 7, 12, 17,
(A) 22, 26 (B) 22, 37 (C) 21, 27 (D) 22, 27 (E) 27, 22
()

6. 3, 6, 7, 14, 15, 30, 31,
(A) 60, 61 (B) 62, 63 (C) 32, 64 (D) 32, 33 (E) 63, 64
()

In each of the following number sequences, pick out the number that does not belong to the sequence.

7. 2, 4, 8, 16, 20
(A) 2 (B) 4 (C) 8 (D) 16 (E) 20 ()

8. 3, 5, 7, 9, 17, 23, 37
(A) 5 (B) 9 (C) 17 (D) 23 (E) 37 ()

9. 2, 4, 6, 8, 10, 12
(A) 2 (B) 4 (C) 8 (D) 10 (E) 12 ()

10. Study the following pattern:

$$\begin{aligned} 9 \times 6 &= 54 \\ 99 \times 96 &= 9504 \\ 999 \times 996 &= 995004 \\ 9999 \times 9996 &= 99950004 \end{aligned}$$

$$\begin{array}{ccccccc} & & & \dots\dots\dots & & \dots\dots\dots & \\ 9999999 \times 9999996 & = & (& &) \end{array}$$

The missing number in the brackets is_____.

- | | | |
|------------------------------|----------------------------|-----------------------------|
| (A) 9999999500000004 | (B) 999999500000004 | (C) 9999995000000004 |
| (D) 99999995000000004 | (E) 99999950000004 | () |

Answers

- | | | | | |
|------|------|------|------|-------|
| 1. D | 2. E | 3. C | 4. A | 5. D |
| 6. B | 7. E | 8. B | 9. A | 10. B |


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks: 

Secondary 1 Mathematics Test Chapter 6 Number Sequences

1. Write down the next two terms of each of the following sequences.
 - (a) ...19, 16, 21, 14, 23, ... [2]
 - (b) 73, 72, 69, 64, 57, ... [1]
2. Fill in the missing numbers.
 - (a) 877, 863, _____, 835, _____ [1]
 - (b) 225, 256, 289, _____, 361, _____, 441 [1]
 - (c) 729, 512, 343, _____, _____, 64 [1]
3. Complete each of the following sequences of numbers.
 - (a) 4, 11, 18, 25, _____, _____ [1]
 - (b) 7, 28, 35, 42, _____, _____ [1]
 - (c) 252, 239, 226, 213, _____, _____ [1]
4. Write down the next two terms of each of the following sequences.
 - (a) 2, 1, 3, 4, 7, 11,... [1]
 - (b) 876, 3, 873, 4, 869, 5,... [2]
5. Write down the rule for obtaining the next term in each of the following sequences.
 - (a) 3, 12, 48, 192,... [1]
 - (b) 199, 187, 175, 163,... [1]
 - (c) ..., 864, 144, 24, 4,... [1]
6. Fill in the missing numbers.
 - (a) 15, 17, 21, 27, _____, _____ [1]
 - (b) 2, 3, 7, 8, 12, 13, _____, _____ [1]
 - (c) 2, 2, 4, 6, 10, 16, _____, _____ [1]
7. Complete the following number sequences.
 - (a) 25, 36, _____, _____, 81, 100 [1]
 - (b) 87, _____, _____, 69, 63, 57 [1]
 - (c) 101, 88, _____, _____, 49, 36 [1]
8. Complete the following number patterns.
 - (a) _____, _____, 234, 251, 268, 285 [1]
 - (b) 7, 11, 17, 25, _____, _____ [2]

9. Complete each of the following number patterns.

(a) $\sqrt{676}, \sqrt{625}, \sqrt{576}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \sqrt{441}$ [2]

(b) $\sqrt[3]{3375}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \sqrt[3]{729}, \sqrt[3]{343}, \sqrt[3]{125}$ [2]

10. Write down the next two terms of each of the following sequences.

(a) 8, 9, 64, 25, 216, 49, $\underline{\hspace{1cm}}$, $\underline{\hspace{1cm}}$ [2]

(b) $3^3, 5^2, 8^3, 12^2, 17^3, 23^2, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$ [2]

11. Complete the following number sequences.

(a) $2^3, 3^3, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, 11^3, 13^3, \underline{\hspace{1cm}}, 19^3$ [2]

(b) $31^2, 29^2, 23^2, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, 13^2, \underline{\hspace{1cm}} 7^2$ [2]

12. Given the following sequence of numbers 11, 11, 22, 33, 55, 88,..., state the rule and write down the next three terms. [3]

13. For the sequence of numbers $\sqrt{4}, \sqrt{16}, \sqrt{36}, \sqrt{64}, \dots$, state the rule and write down the next three terms. [3]

14. For the sequence of numbers $\sqrt{4}, \sqrt{9}, \sqrt{25}, \sqrt{49}, \sqrt{121}, \dots$, state the rule and write down the next three terms. [3]

15. (a) For the sequence of numbers 2, 3, 5, 5, 7, 12, 11, 13, 24,..., write down the next three terms. [2]

(b) Complete the number sequence, $41^3, 43^3, 47^3, 53^3, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$.

10. (a) 512, 81 (b) $30^3, 38^2$

16. (a) A sequence is 3, 4, 6, 10, 18,... .What are the next two terms in this sequence? [2]

(b) Starting at 17 and counting by 7s, a student counts 17, 24 and so on. What are the 5th and 6th numbers that will be counted? [2]

17. (a) The largest two-digit number to be found in the sequence 5, 16, 27, 38,... is $\underline{\hspace{1cm}}$. [1]

(b) The largest three-digit number to be found in the sequence 8, 27, 64, 125,... is $\underline{\hspace{1cm}}$. [2]

18. (a) The smallest three-digit number to be found in the sequence 4, 9, 16, 25,... is $\underline{\hspace{1cm}}$. [1]

(b) The smallest four-digit number to be found in the sequence 2, 6, 18, 54,... is $\underline{\hspace{1cm}}$. [2]

19. Fill in the missing numbers.

(a) 1, 4, 13, 40, $\underline{\hspace{1cm}}$, $\underline{\hspace{1cm}}$ [2]

(b) 6, 9, 12, 18, 18, 27, $\underline{\hspace{1cm}}$, $\underline{\hspace{1cm}}$ [2]

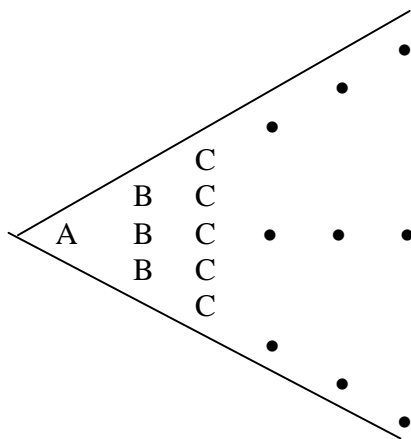
20. Write down the next two terms of each of the following sequence.
- (a) 2, 4, 7, 11, 16,... [1]
 (b) 1, 5, 13, 29, 61,... [2]
21. (a) Write down the next three terms of the sequence 0, 3, 6, 12, 24,... [2]
 (b) Write down the next three terms of the sequence 4, 7, 10, 16, 28,... and explain how this sequence is related to the sequence in (a). [3]
22. (a) Write down the next three terms of the sequence 2, 5, 10, 17, 26,... [2]
 (b) Given the sequence of numbers 5, 4, 13, 16, 29, 36,...
 (i) explain how this sequence is obtained from the sequence in (a). [1]
 (ii) write down the next two terms of this sequence. [1]
23. The number 8 occurs in both the sequence 2, 5, 8, 11,... and the sequence 3, 8, 13, 18,... What are the next two numbers which occur in both sequences? [3]
24. A plant is now 11 cm tall and will grow 3 cm per week. Another plant is now 7 cm tall and will grow 4 cm per week. How many weeks will the second plant take to grow as tall as the first plant? [3]
25. If the number pattern shown is continued,
 (a) what is the third number in the fifth row, [1]
 (b) what is the sum of the numbers in the sixth row? [2]
- $$\begin{array}{ccccccc}
 & & & & 1 & & \\
 & & & & 1 & & 1 \\
 & & & 1 & 2 & 1 & \\
 & & 1 & 3 & 3 & 1 & \\
 1 & 4 & 6 & 4 & 1 & &
 \end{array}$$
26. Consider the pattern:
- $$\begin{array}{l}
 3(0) + 1 = 1 \\
 3(1) + 1 = 4 \\
 3(2) + 1 = 7 \\
 3(3) + 1 = 10 \\
 \vdots \\
 \vdots \\
 3(n) + 1 = 88
 \end{array}$$
- (a) Write down the 10th line in the pattern. [1]
 (b) Find the value of n . [2]

27. The diagram shows a pattern of letters.

(a) If the pattern is continued, how many letters will appear in the

(i) the “D” column? [1]

(ii) the “E” column? [1]



(b) Complete the table below, showing the number of letters in each column.

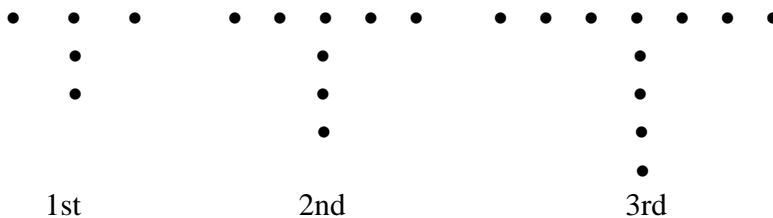
Letter	A	B	C	D	E	...
No. of letters	$2(1)-1 = 1$	$2(2)-1 = 3$	$2(3)-1 = 5$

[1]

(c) How many letters will appear in the “J” column? [1]

(d) Which column will contain 29 letters? [2]

28. The diagram shows the first three patterns of dots in a sequence.



(a) Draw the 4th pattern of dots. [1]

(b) How many dots are there in the 5th pattern? [1]

(c) Complete the table below. [2]

Pattern of dots	1st	2nd	3rd	4th	5th	...
No. of dots	$5=3(1)+2$	$8=3(2)+2$...

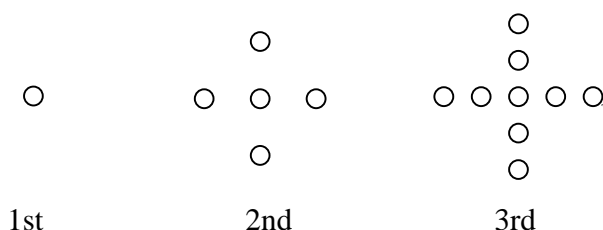
(d) How many dots are there in the 38th pattern? [1]

29. Consider the pattern:

$$\begin{array}{rcl}
 1^3 - 1 = 0 & = & (1-1) \times 1 \times (1+1) \\
 2^3 - 2 = 6 & = & (2-1) \times 2 \times (2+1) \\
 3^3 - 3 = 24 & = & (3-1) \times 3 \times (3+1) \\
 4^3 - 4 = 60 & = & (4-1) \times 4 \times (4+1) \\
 & & \vdots \\
 & & \vdots \\
 n^3 - n = 1320 & = & (n-1) \times n \times (n+1) \\
 & & \vdots \\
 & & \vdots
 \end{array}$$

- (a) Write down the seventh line in the pattern. [1]
 (b) Find the value of $19^3 - 19$. [1]
 (c) Find the value of n . [2]

30. The diagram shows the first three patterns of circles in a sequence.



- (a) Draw the 4th pattern of circles. [1]
 (b) How many circles are there in the 5th pattern? [1]
 (c) Complete the table below.

Pattern of circles	1st	2nd	3rd	4th	5th	...
No. of circles	$1 = 4(1) - 3$	$5 = 4(2) - 3$...

- (d) Which pattern in the sequence contains a total of 197 circles? [2]

31. Write down the next two terms in the following number sequences.

- (a) 50, 45, 44, 39, 38, 33, ...
 (b) 31, 30, 28, 25, 21, ...
 (c) 10, 16, 17, 23, 24, 30, ...
 (d) 1, 3, 4, 7, 11, ...
 (e) 41, 34, 27, 20, ...
 (f) 2, 5, 11, 23, 47, ... [6]

32. Find

- (a) the next three terms in the sequence 9, 11, 15, 21, 29, ...
 (b) the two prime numbers from this sequence.
 (c) the two numbers whose H.C.F. is 13 from this sequence.
 (d) the three numbers whose L.C.M. is 195 from this sequence. [5]

33. The following triangle of numbers is called *Pascal's triangle*.

$$\begin{array}{ccccccc}
 & & & & 1 & & \\
 & & & 1 & & 1 & \\
 & & 1 & & 2 & & 1 \\
 & 1 & & 3 & & 3 & & 1 \\
 1 & & 4 & & 6 & & 4 & & 1
 \end{array}$$

- (a) State the rule for obtaining terms which are not equal to 1 in the triangle. [2]
 (b) Write down (i) the next two rows,
 (ii) the sum of the terms in each row. Do these sums form a pattern? [3]
 (c) Find the sum of the terms in (i) the eleventh row,
 (ii) the k th row. [3]
 (d) Write down (i) the number of terms in the k th row,
 (ii) the first two terms in the k th row. [3]

34. Study the following number patterns and describe your observation.

$$\begin{aligned}
 1 + 2 + 1 &= 4 \\
 1 + 2 + 3 + 2 + 1 &= 9 \\
 1 + 2 + 3 + 4 + 3 + 2 + 1 &= 16 \\
 1 + 2 + 3 + 4 + 5 + 4 + 3 + 2 + 1 &= 25
 \end{aligned}$$

Use your observation to write down

- (a) the answer for $1 + 2 + 3 + 4 + \dots + 99 + 100 + 99 + \dots + 3 + 2 + 1$. [2]
 (b) the value of n given that $1 + 2 + 3 + \dots + (n-1) + n + (n-1) + \dots + 3 + 2 + 1 = 7056$. [6]

35. Complete the number pattern:

$$\begin{aligned}
 (1)^2 &= 1 = (1)^3 \\
 (1 + 2)^2 &= 9 = (1)^3 + (2)^3 \\
 (1 + 2 + 3)^2 &= \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\
 (1 + 2 + 3 + 4)^2 &= \underline{\hspace{2cm}} = \underline{\hspace{2cm}}
 \end{aligned}$$

- (a) Find the value of $(1)^3 + (2)^3 + (3)^3 + \dots + (l)^3$ when l is (i) 7 (ii) 19 [4]
 (b) If $(1 + 2 + 3 + \dots + n)^2 = 2025$, find the value of n . [2]
 (c) If $(1)^3 + (2)^3 + (3)^3 + \dots + (m)^3 = 78^2$, find the value of m . [2]

36. Consider the Fibonacci sequence: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ... and complete the number pattern below:

$$\begin{aligned}
 1^2 &= 1 \times 1 \\
 1^2 + 1^2 &= 1 \times 2 \\
 1^2 + 1^2 + 2^2 &= 2 \times 3 \\
 1^2 + 1^2 + 2^2 + 3^2 &= \underline{\hspace{2cm}} \\
 1^2 + 1^2 + 2^2 + 3^2 + 5^2 &= \underline{\hspace{2cm}}
 \end{aligned}$$

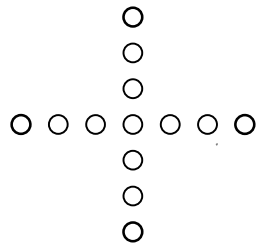
- (a) Write down the seventh line. [1]
 (b) If $1^2 + 1^2 + 2^2 + 3^2 + 5^2 + \dots + l^2 + m^2 = 55 \times n$, find the values of l , m and n . [3]

Answers

1. (a) 12, 25 (b) 48, 37
2. (a) 849, 821 (b) 324, 400 (c) 216, 125
3. (a) 32, 39 (b) 49, 56 (c) 200, 187
4. (a) 18, 29 (b) 864, 6
5. (a) multiply a term by 4 to obtain the next term.
(b) subtract 12 from a term to obtain the next term
(c) divide a term by 6 to obtain the next term
6. (a) 35, 45 (b) 17, 18 (c) 26, 42
7. (a) 49, 64 (b) 81, 75 (c) 75, 62
8. (a) 200, 217 (b) 35, 47
9. (a) $\sqrt{529} = 23, \sqrt{484} = 22$ (b) $\sqrt[3]{2197} = 13, \sqrt[3]{1331} = 11$
10. (a) 512, 81 (b) $30^3, 38^2$
11. (a) $5^3, 7^3, 17^3$ (b) $19^2, 17^2, 11^2$
12. A term is obtained by adding the two previous terms; 143, 231, 374.
13. Start with 2, then add 2 to each term to obtain the next term;
 $\sqrt{100} = 10, \sqrt{144} = 12, \sqrt{196} = 14$
14. Write down the prime numbers in ascending order.
 $\sqrt{169} = 13, \sqrt{289} = 17$
15. (a) 17, 19, 36 (b) $59^3, 61^3$
16. (a) 34, 66 (b) 45, 52
17. (a) 93 (b) 729
18. (a) 100 (b) 145
19. (a) 121, 364 (b) 24, 36
20. (a) 22, 29 (b) 125, 253

21. (a) 48, 96, 192
 (b) 52, 100, 196; A term in the second sequence is 4 more than the corresponding term in first sequence.
22. (a) 37, 50, 65
 (b) (i) Add 3 to the odd number terms and subtract 1 from the even number terms of the first sequence to obtain the second sequence.
 (ii) 53, 64
23. 23, 38
24. 4 weeks
25. (a) 10 (b) 44
26. (a) $3(9) + 1 = 28$ (b) 29
27. (a) (i) 7 (ii) 9
 (b) $2(4) - 1 = 7$, $2(5) - 1 = 9$
 (c) 19
 (d) the "O" column
28. (a) $\bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet$
 \bullet
 \bullet
 \bullet
 \bullet
 \bullet
 (b) 17
 (c) $11 = 3(3) + 2$, $14 = 3(4) + 2$, $17 = 3(5) + 2$
 (d) 116
29. (a) $7^3 - 7 = 336 = (7 - 1) \times 7 \times (7 + 1)$
 (b) 6840 (c) 11

30. (a)



(b) 17

(c) $9 = 4(3) - 3$, $13 = 4(4) - 3$, $17 = 4(5) - 3$

(d) 50th pattern

31. (a) 32, 27

(b) 16, 10

(c) 31, 37

(d) 18, 29

(e) 13, 6

(f) 95, 191

32. (a) 39, 51, 65

(b) 11, 29

(c) 39, 65

(d) 15, 39, 65

33. (a) Term is obtained by adding the two immediately above.

(b) (i) 1 5 10 10 5 1; 1 6 15 20 15 6 1

(ii) 1, 2, 4, 8, 16, 32, 64; Yes

(c) (i) $2^{10} = 1024$

(ii) 2^{k-1}

(d) (i) k

(ii) $1, k - 1$

34. The sum of the numbers is given by the square of the term in the middle.

(a) 100 000

(b) 84

35. $36 = (1)^3 + (2)^3 + (3)^3$; $100 = (1)^3 + (2)^3 + (3)^3 + (4)^3$

(a) (i) 784

(ii) 36 100

(b) $n = 9$

(c) $m = 12$

36. 3×5 ; 5×8

(a) $1^2 + 1^2 + 2^2 + 3^2 + 5^2 + 8^2 + 13^2 = 13 \times 21$

(b) $l = 34$, $m = 55$, $n = 89$

Chapter 7

Secondary 1 Mathematics
Chapter 7 Algebraic Equations and Simple Inequalities

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 141)

- (a) (i) Put 3 marbles on each side of the balance to determine which of the 3 contains the heavier marble.
- (ii) Put each marble from the heavier lot on the balance to determine which is the heavier one. If they balance, the remaining one will be the heavier.
- (b) Put 3 marbles on each side of the balance to determine which side contains the heavier marble. If the sides balance, then the marble left behind is the heavier one. Otherwise follow step (a)(ii) to find out the heavier one.
- (c) Put 3 marbles on each side of the balance, and use (a)(ii) to determine which marble is the heavier one. If the sides balance, then put the two remaining marbles on the balance again to determine the heavier one.
- (d) Put 3 marbles on each side of the balance to determine which side contains the heavier marble. Then use (a)(ii) to determine which marble is heavier.

Just For Fun (pg 155)

You need only 10 cats to catch 100 mice in 100 minutes.

Secondary 1 Mathematics

Chapter 7 Algebraic Equations and Simple Inequalities

GENERAL NOTES

To illustrate that equal numbers may be added or subtracted from both sides of an equation and each side of an equation may be multiplied or divided by equal numbers, teachers may like to use an actual balance from the science laboratory to illustrate the concept, especially to weaker students.

For students who still have difficulty understanding the concept that you can add, subtract, multiply or divide both sides of an equation without changing its accuracy, the teacher may use money in place of weights making it easier for students to understand. For example,

$$\boxed{\$2} + \boxed{\$1} = (\$1) (\$1) + (50\text{¢}) (50\text{¢})$$

Subtracting \$1 from both sides, we have

$$\boxed{\$2} = (\$1) (\$1)$$

The concept of transferring a term from one side of an equation to another side and changing the signs could be introduced after students have enough practice with adding or subtracting equal numbers from both sides of an equation and multiplying or dividing each side of an equation by equal numbers. This is an area where many errors frequently occur.

Common Errors Made By Students

$$(1) \quad \frac{x}{2} = x + 1 \qquad \therefore x = 2x + 1$$

$$(2) \quad \frac{2x+1}{3} - \frac{x-7}{3} = 2 \qquad \therefore \frac{2x+1-x-7}{3} = 2$$

$$(3) \quad 14x = 7x - 21 \qquad \therefore 2x = x - 21$$

$$(4) \quad \frac{5+2x}{4} = 14 \qquad \therefore \frac{5+x}{4} = 7, 5+x = 28$$

$$(5) \quad \frac{5+2x}{4} = 14 \qquad \therefore \frac{5+x}{2} = 14, 5+x = 28$$

$$(6) \quad 3x - 2(x - 1) = 5 \qquad \therefore 3x - 2x - 2 = 5$$


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: 35 min

Marks: 

Secondary 1 Multiple-Choice Questions Chapter 7 Algebraic Equations and Simple Inequalities

- John is 4 times as old as David. In 2 years' time, John will be 3 times as old as David. How old is David now?
(A) 4 (B) 5 (C) 6 (D) 8 (E) 10 ()
- Abel is three times as old as Ben. Three years ago, Abel was four times as old as Ben. Find the sum of their ages in three years' time.
(A) 26 (B) 30 (C) 33 (D) 34 (E) 42 ()
- Tom is 28 years older than his son, Dick, who will be x years old in y years' time. How old is Tom?
(A) $x + y + 28$ (B) $x + y - 28$ (C) $x - y + 28$
(D) $y - x + 28$ (E) $x - y - 28$ ()
- If $2x - 4$ is greater than $(-3x + 4)$ by 2, then x is _____.
(A) -0.4 (B) -1 (C) -2 (D) 1.2 (E) 2 ()
- If $2x + 1 = 9$, then $4x + 1$ is _____.
(A) 13 (B) 15 (C) 16 (D) 17 (E) 19 ()
- If 5 pencils cost x cents, then the cost of y similar pencils in dollars is _____.
(A) $\frac{xy}{5}$ (B) $\frac{xy}{20}$ (C) $\frac{x}{20y}$ (D) $\frac{y}{20x}$ (E) $\frac{xy}{500}$ ()
- Solve the equation $\frac{x + 6}{4} = \frac{1 + x}{2}$.
(A) -8 (B) -4 (C) $1\frac{1}{3}$ (D) 4 (E) 8 ()
- The solution of $-2 - \frac{2x}{5} + \frac{3x}{2} = 4\frac{3}{5}$ is _____.
(A) 4 (B) $5\frac{1}{2}$ (C) 6 (D) 7 (E) 8 ()

9. x can take all values in $x + 4 = x + 7 + y$ provided y is equal to _____.
 (A) 11 (B) 3 (C) -3 (D) 28 (E) x ()
10. In a class, the average age of m boys is a years and n girls b years. The average age of the class is _____.
 (A) $\frac{a + b}{2}$ (B) $\frac{a + b}{m + n}$ (C) $\frac{ab}{mn}$
 (D) $(a + b)(m + n)$ (E) $\frac{ma + nb}{m + n}$ ()
11. Solve the equation $6(x - 0.2) = 4(x - 0.1)$
 (A) 0.04 (B) 0.2 (C) 0.4 (D) 0.8 (E) 4 ()

Answers

- | | | | | |
|-------|------|------|------|-------|
| 1. A | 2. E | 3. C | 4. E | 5. D |
| 6. E | 7. D | 8. C | 9. C | 10. E |
| 11. C | | | | |


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks: 

Secondary 1 Mathematics Test Chapter 7 Algebraic Equations and Simple Inequalities

1. If $5(2x - 3) - 3(x - 2) = 0$, find the value of $7x + 2$. [2]

2. Solve the following equations.

(a) $15x + 4 = 4x + 103$

(b) $\frac{2}{3}x + 15 = 4x$ [4]

3. If $y = \frac{2}{3}(24 - x) + 5xy$, find the value of y when $x = -3\frac{1}{3}$. [3]

4. If $\frac{1}{x} = (a - 2)(\frac{1}{h} + \frac{1}{k})$, find the value of x when $a = 3\frac{1}{2}$, $h = 10$ and $k = 15$. [3]

5. If $\frac{3x + 2y - 5z}{y - 4z} = \frac{x}{3y}$, find the value of x when $y = 6$ and $z = -\frac{1}{2}$. [3]

6. Solve the equation $\frac{x}{3} - \frac{7(x - 2)}{9} = 4 - \frac{2x - 5}{6}$. [4]

7. Solve the equation $\frac{5x - 1}{8} - \frac{5 - 7x}{2} = \frac{3(6 - x)}{6}$. [3]

8. Solve the equation $\frac{5}{2x} - \frac{7}{5x} = \frac{2}{3}$. [3]

9. Solve the equation $5x - 1\frac{3}{4} = 6 + 1\frac{2}{3}x - \frac{5}{6}$. [3]

10. Solve the equation $2x - \frac{x}{4} + \frac{3x}{5} = 14 + \frac{7x}{3}$. [3]

11. Solve the equation $\frac{2}{5}(8k - 6) = \frac{3}{4}(2k + 5)$. [3]

12. Solve the following equations.

(a) $3x - [3 - 2(3x - 7)] = 37$. [2]

(b) $\frac{7}{2x} + \frac{5}{3x} = 1\frac{5}{6}$ [2]

13. If $x^2 + 5x = 5$, find the value of $x(x^2 + 5x) + x^2$. [2]

14. Solve the equation $\frac{2x-1}{3} - \frac{3x-4}{5} = \frac{4}{7}$. [3]

15. Solve the equation $5(3x - 2) - 7(x - 1) = 12$. [3]

16. Solve the equation $\frac{3}{2x+5} = \frac{4}{1-3x}$. [3]

17. Solve the following equations.

(a) $2x - 3(5 - x) = 35$ [2]

(b) $1.3x - 3.6 = 2(\frac{2}{5}x + 1)$ [3]

(c) $\frac{2}{3}(6x + 5) = 7(x - 4.5)$ [3]

18. Solve the equation $\frac{\frac{2x-3}{4} - 2}{x} = 3\frac{1}{2}$. [4]

19. Solve the equation $5(x - 2)^2 = 35$, giving your answer correct to 2 decimal places. [3]

20. Dollah is three times as old as Kumar. In 12 years' time the sum of their ages will be equal to 10 times Kumar's present age. Find their present ages. [4]

21. The sum of three consecutive odd numbers is 135. Find the largest odd number. [3]

22. A man has enough money to buy either 12 pears or 36 apples. If he intends to buy equal number of pears and apples, how many of each can he buy with the money? [4]

23. Find two consecutive even numbers such that the sum of the larger and three times the smaller number is 42. [4]

24. John is 5 years younger than Robert. If the sum of their ages in 8 years' time is 37, find John's age in 3 years' time. [4]

25. The sum of two numbers is 45. $\frac{2}{3}$ of the smaller number is greater than $\frac{1}{5}$ of the larger number by 4. Find the two numbers. [4]
26. The sum of three numbers is 109. The second number is 4 times the first and the third is 8 less than the second. Find the three numbers. [4]
27. Elvin and Carol had \$42 and \$30 respectively. They each spent the same amount of money on a pair of shoes. How much was the pair of shoes if Elvin had twice as much money as Carol after buying the pair of shoes? [4]
28. A woman is now 8 times as old as her son. Two years ago, she was 15 times as old as her son.
- If the son is x years old now, write down the woman's present age in terms of x . [1]
 - Write down an expression for the son's age two years ago. [1]
 - Form an equation in x . Solve the equation to find the woman's age in 5 years' time. [3]
29. A boy cycles from home for x km at 9 km/h to the MRT station. He waited for 3 minutes before catching the next MRT train. The MRT train travels at an average speed of 60 km/h. He walks for $\frac{1}{2}$ km at an average speed of 6 km/h before reaching his school. The distance from his home to the school by the above route is 12 km and the total time he spent is 28 minutes.
- Express, in terms of x , the time he spent cycling. [1]
 - The distance travelled by the MRT train. [1]
 - Form an equation in x and solve it. [3]
30. A man bought x apples and twice as many oranges. He also bought 5 pears fewer than apples. Apples cost 40 cents each, oranges cost 30 cents each and pears cost 80 cents each. If the man spent a total of \$77, find
- the value of x , [4]
 - the amount he spent on pears. [1]
31. A restaurant owner bought some ducks which cost \$7.50 each, some chickens which cost \$3.80 each and some geese which cost \$12.80 each. The number of chickens bought is three times the number of ducks and the number of geese is half the number of ducks. If the restaurant owner paid a total of \$607.20, find the number of geese bought. [4]

32. A salesman earns an amount of \$ A per week which is made up of a basic wage of \$90 plus 12 cents for each of the n articles that he sells. The formula connecting A and n in this case is

$$A = 90 + \frac{12n}{100}.$$

- (a) Calculate the amount of money the salesman earned in a week when he sold 580 articles. [2]
- (b) At the end of the following week, the salesman earned \$190.80. How many articles did he sell? [2]
- (c) His employer decided to revise the weekly wages of the salesman to a basic wage of \$80 plus 16 cents for each of the article sold. Write down the formula connecting A and n . [1]
- (d) Find the number of articles the salesman must sell in a week to earn the same amount from either formula. [2]
33. John is $4x$ years old and his brother is half his age. Find, in its simplest form, the sum of the ages of the two boys
- (a) at the present time,
- (b) in eight years' time. [4]
34. Solve the following equations:
- (a) $\frac{x-3}{5} = \frac{2x-7}{8}$,
- (b) $0.3(4x-1) = 0.8+x$,
- (c) $5(2-3x) - (1+7x) = 5(3-6x)$. [6]
35. Find the difference between $5x$ minutes and $24x$ seconds, giving your answer in seconds. [3]
36. Find the total cost, in dollars, of 15 pencils at $2x$ cents each and 24 pens at $4y$ cents each. [3]
37. Adam is 4 years younger than Betty. Charles is 3 years older than Betty. If the sum of their ages is 41, how old will Charles be in 5 years' time? [4]
38. The result of adding 14 to twice a number is the same as subtracting 8 from four times that number. Find the number. [4]
39. The sum of 4 consecutive odd numbers is 64. Find the largest of the 4 numbers. [4]
40. A father is seven times as old as his son. If the sum of their ages in 15 years' time is 62, how old will the father be when the son reaches the age of 15? [4]
41. Ahmad is three times as old as Ali. Seven years ago, the sum of their ages was 30. How old will Ali be when Ahmad is 40 years old? [4]

42. The average of four numbers is 56. The first number is 5 more than the second; the third number is half of the second and the fourth number is three times the sum of the first and second numbers. Find the numbers. [4]
43. The number 84 is divided into two parts. If the difference between half of the first part and one-third of the second part is 12, find the two parts of the number. [4]
44. Chandra is three times as old as Devi. Four years ago, their total age was equal to Chandra's present age. Find their present ages. [4]
45. Solve the following inequalities.
- (a) $3x - 2x > 5 + 7$ [2]
 (b) $5x - 2x \leq 3 + 9$ [2]
46. Solve the following inequalities.
- (a) $2(x - 2) > x + 5$
 (b) $\frac{1}{2}x > 3$
 (c) $\frac{3x}{4} \leq \frac{3}{8}$ [6]
47. Solve the following inequalities.
- (a) $11x \leq 25$
 (b) $\frac{4}{5}x \leq 1\frac{1}{2}$
 (c) $\frac{2x}{3} - \frac{x}{6} \leq \frac{1}{2} + 3\frac{1}{4}$ [6]
48. Solve the following inequalities.
- (a) $\frac{x}{2} + \frac{x}{4} \leq 15 - 24$
 (b) $\frac{3x}{4} - \frac{x}{8} \geq 1\frac{1}{2} + 3\frac{3}{4}$ [4]
49. A music CD costs \$17.80. How many music CD can John buy if he has \$50 in his pocket? [2]
50. Consider the sequence 3, 7, 11, 15, 19
- (a) What is the greatest term of the sequence that is less than 50 and what is its value?
 (b) What is the least term of the sequence that is bigger than 100 and what is its value? [4]

Answers

1. 11

2. (a) 9 (b) 4.5

3. $1\frac{5}{159}$

4. 4

5. $-5\frac{31}{46}$

6. -29.5

7. $1\frac{2}{7}$

8. $1\frac{13}{20}$

9. $2\frac{3}{40}$

10. 840

11. $3\frac{27}{32}$

12. (a) $2\frac{2}{9}$ (b) $2\frac{9}{11}$

13. 5

14. $1\frac{4}{7}$

15. $1\frac{7}{8}$

16. -1

17. (a) 10 (b) 11.2 (c) $11\frac{11}{18}$

18. $-\frac{11}{12}$

19. 4.65, -0.65

20. 4 years, 12 years

21. 47

22. 9

23. 10, 12

24. 11

25. 15, 30

26. 13, 52, 44

27. \$18

28. (a) $8x$ (b) $x - 2$ (c) 37

29. (a) $6\frac{2}{3}x$ (b) $11.5 - x$ (c) $1\frac{1}{2}$

30. (a) 45 (b) \$32

31. 12

32. (a) \$159.60 (b) 840 (c) $A = 80 + \frac{16n}{100}$ (d) 250

33. (a) $6x$ (b) $6x + 16$

34. (a) $5\frac{1}{2}$ (b) 5.5 (c) $\frac{3}{4}$

35. $276x$

36. $\frac{15x + 48y}{50}$

37. 22 years

38. 11

39. 19

40. 39

41. 18

42. 29, 24, 12, 159

43. 48, 36

44. 24, 8

45. (a) $x > 12$ (b) $x \leq 4$

46. (a) $x > 9$ (b) $x > 6$ (c) $x \leq \frac{1}{2}$

47. (a) $x \leq 2\frac{3}{11}$ (b) $x \leq 1\frac{7}{8}$ (c) $x \leq 7\frac{1}{2}$

48. (a) $x \leq -12$ (b) $x \geq 8\frac{2}{5}$

49. 2

50. (a) 12th, 47

(b) 26th, 103

Chapter 8

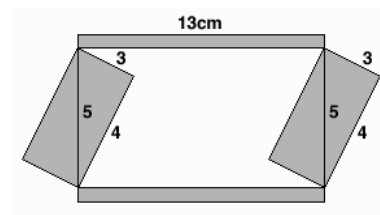
Secondary 1 Mathematics **Chapter 8 Perimeter and Area of Simple Geometrical Figures**

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 173)

$$\begin{aligned} \text{The area enclosed} &= 13 \times 5 - 2\left\{\frac{1}{2}(3 \times 4)\right\} \\ &= 65 - 12 \\ &= 53 \text{ cm}^2 \end{aligned}$$

(Briefly mention the Pythagoras Theorem.)



Just For Fun (pg 174)

The shaded regions in all the figures are the same. Note that the unshaded regions in each of the given square form a circle.

Just For Fun (pg 174)

Yes. It is approximately 16 cm above the equator.

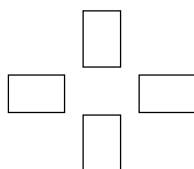
Originally $2\pi r = 40\,000 \times 1000 \text{ m}$,

$r = 6366197.724 \text{ m}$.

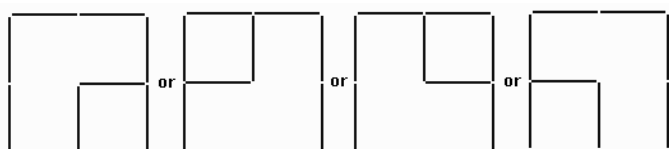
New radius R is given by $2\pi R = 40\,000\,001 \text{ m}$.

$\therefore R = 6\,366\,197.883 \text{ m}$, resulting in a difference of approximately 16 cm.

Just For Fun (pg 180)



Just For Fun (pg 181)



Secondary 1 Mathematics

Chapter 8 Perimeter and Area of Simple Geometrical Figures

GENERAL NOTES

As introductory work, you may wish to revise orally with your students on the use of appropriate units of measurement when it comes to measuring, say, some common lengths and areas which they may encounter in their daily lives. For example, what are the common units of measurement of a person's height, the length of a leaf, the distance between the school and the students' homes, the thickness of one's hair, area of land? You may like to use the micrometer to measure the thickness of a sample of the students' hair.

To encourage students to do their own research in the library, you can ask them to find out the land area and the length of the coastline of Singapore in 1970, 1980 and 1990. They can then see for themselves how Singapore has 'grown' over the years through land reclamation. (Since the land reclamation programme started in the 1960's until June 1996, Singapore has an addition of 26.59 km² of land or 4% of total land area.) These data are available in the Singapore yearbook which is published annually. The older editions are available in the National Library.

You can spend less time on the respective sections on finding the areas and perimeters of squares, rectangles, triangles and circles since the students have been taught how to use all these formulae in their primary schools. Instead you can concentrate more on showing them how to find the area of parallelograms and trapeziums.

As a class activity, you can ask the students to construct and cut out a parallelogram of sides 10 cm by 8 cm and a fairly large trapezium about half the size of a piece of A4 paper. Use the approach given on pages 179 and 180 of the textbook to guide pupils in seeing for themselves that the area of a parallelogram can be expressed as the product of:

the base and the perpendicular distance between the parallel sides.

Through this activity, students may find it easier to remember the formulae for finding the areas of parallelograms and trapeziums.

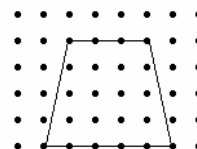
Another interesting activity which you may like to get your students involved in is verifying Pick's formula which states that the area of a shape drawn on a geoboard or points on a coordinate graph can be found by using the formula, $A = \frac{1}{2}b + i - 1$,

where A = area of the shape drawn,

b = number of points on the boundary of the figure and

i = number of points inside the shape.

As an example, you can show them how to find the area of the trapezium shown by using Pick's formula where $b = 10$ and $i = 12$.



$$\begin{aligned}\text{Thus area of trapezium} &= \frac{1}{2} (10) + 12 - 1 \\ &= 16 \text{ units}^2\end{aligned}$$

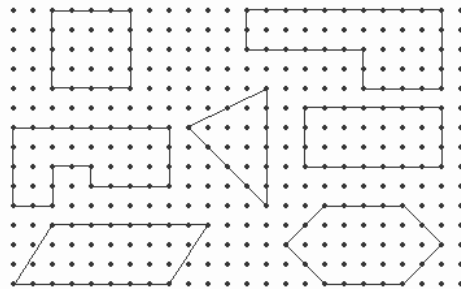
To check, find the area of the trapezium by using the formula

$$\text{area of trapezium} = \frac{1}{2} (\text{sum of parallel sides}) \times \text{height}.$$

$$\begin{aligned}\text{In this case, area of trapezium} &= \frac{1}{2} (3 + 5) \times 4 \\ &= 16 \text{ units}^2\end{aligned}$$

You may get your students to draw different regular shapes such as rectangles, squares, etc., on a geoboard or points on a coordinate graph and then use Pick's formula to find their areas. Ask them to verify Pick's formula by using other formulae to find the areas of the shapes they have drawn and see whether they arrive at the same answer.

Shown below are some of the shapes which they can draw.



Common Errors Made By Students

- (1) Some students fail to convert different units of measurement to the same unit when they work out the answers to certain questions such as the one shown below.

Example: The length of a rectangle is 2.8 m while its width is 40 cm. Find its area and perimeter. You may get answers like:

$$\text{Area} = 2.8 \times 40 \text{ cm}^2 \text{ or } \text{m}^2$$

$$\text{Perimeter} = (2.8 \times 2 + 40 \times 2) \text{ cm}$$

Students should constantly be reminded to be mindful of the different units used in a question and to change all units to one common unit, i.e. m or cm for the above question.

- (2) Some students misread questions or use the wrong formula to get answers. For example, when they are given the diameter or radius of a circle, they tend to assume that the given length is the radius if they use $2\pi r$ to find the circumference of a circle or the diameter if they use πd . However, this may not be the case. Therefore, they need to be reminded to use the correct formula for a given length and to read each question carefully.
- (3) Some students confuse the formula for finding the area of a parallelogram with that of a square or rectangle. They take the adjacent sides of the parallelogram to be the breadth. Remind them to use formulae correctly.


XYZ SECONDARY SCHOOL

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Date: _____

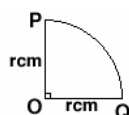
Time allowed: 35 min

Class: _____

Marks: 

Secondary 1 Multiple-Choice Questions Chapter 8 Perimeter and Area of Simple Geometrical Figures

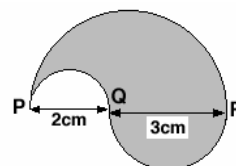
1. The figure on the right shows a quadrant of radius r cm. If the perimeter of the quadrant is 50 cm, calculate the area of the quadrant. (Take $\pi = 3\frac{1}{7}$.)



- (A) 616 cm^2 (B) $452\frac{4}{7} \text{ cm}^2$ (C) $314\frac{2}{7} \text{ cm}^2$
(D) 308 cm^2 (E) 154 cm^2 ()

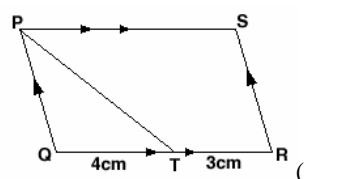
2. The figure shown on the right is formed from three circular arcs. Given that $PQ = 2$ cm and $QR = 3$ cm, calculate the area of the shaded region in cm^2 .

- (A) 3.75π (B) 5.25π (C) 6.25π
(D) 7.5π (E) 9.25π ()



3. $PQRS$ is a parallelogram of area 35 cm^2 . T is a point on QR such that $QT = 4$ cm and $TR = 3$ cm. Calculate the area of ΔPQT .

- (A) 12 cm^2 (B) 10 cm^2 (C) 17.5 cm^2
(D) 20 cm^2 (E) 28 cm^2 ()



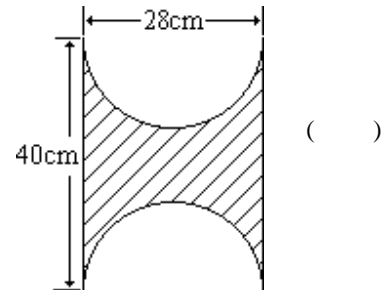
4. The area of a trapezium is 45 cm^2 and the distance between its parallel sides is 5 cm. If the length of one of its parallel sides is 6 cm, find the length of the other parallel side.
(A) 15 mm (B) 3 cm (C) 12 cm (D) 15 cm (E) 18 cm ()

5. A private rectangular swimming pool of length 20 m and width 17 m is surrounded by a walkway of width 1.5 m. Find the area of the walkway.

(A) $57\frac{3}{4}$ m² (B) 102 m² (C) 111 m² (D) 120 m² (E) 129 m² ()

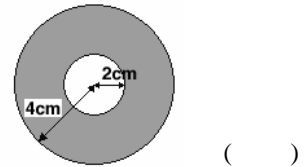
6. The perimeter of the figure is _____.

(A) 168 cm (B) 124 cm (C) 128 cm
(D) 256 cm (E) 136 cm



7. Area of the shaded region: area of the big circle = _____.

(A) 1 : 2 (B) 3 : 4 (C) 1 : 4
(D) 1 : 3 (E) 2 : 3



Answers

- | | | | | |
|------|------|------|------|------|
| 1. E | 2. A | 3. B | 4. C | 5. D |
| 6. A | 7. B | | | |


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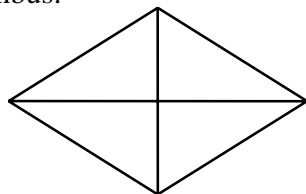
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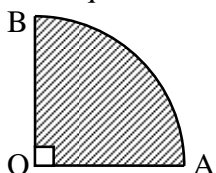
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Secondary 1 Mathematics Test Chapter 8 Perimeter and Area of Simple Geometrical Figures

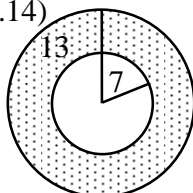
1. The area of a rhombus is 90 cm^2 . If the length of a diagonal is 18 cm, calculate the length of the other diagonal. [2]
2. The diagonals of a rhombus are 28 cm and 24 cm.
Find the area of the rhombus. [3]



3. OAB is a quadrant of a circle of radius 10 cm. Calculate
(a) the perimeter, [2]
(b) the area of the quadrant. [2]



4. The diagram shows two concentric circles of radius 7 cm and 13 cm. Calculate
(a) the perimeter of the shaded area, [2]
(b) the area of the shaded region. [3]
(Take $\pi = 3.14$)



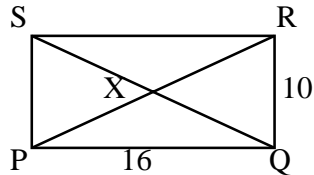
5. PQRS is a rectangle where the diagonals PR and QS meet at X. If PQ = 16 cm and QR = 10 cm, find the area of

(a) $\triangle PQX$,

[2]

(b) $\triangle QRX$.

[2]



6. The length of a rectangle is 8 cm longer than its width. If the perimeter of the rectangle is 80 cm, find (a) its length, [2]
(b) its area. [2]

7. How many complete revolutions will a wheel make in covering a distance of 200 m. if the diameter of the wheel is 25 cm? [3]

(Take $\pi = 3.142$)

8. The length of a rectangle is 3 times its width. If the perimeter of the rectangle is 1960 cm, calculate the area of the rectangle in m^2 . [3]

9. The perimeter of a square is 48 cm. Find its area. [2]

10. The minute hand of a clock is 8 cm long. Find the distance moved by the tip of the hand in 26 minutes. Give your answer correct to 1 decimal place. [3]

(Take $\pi = 3.142$)

11. A piece of wire of length 12.8 cm is bent to form a square. Find the area of the square formed. [3]

12. The height of a trapezium is 12 cm. Find the sum of its parallel sides if its area is 210 cm^2 . If the longer side is $2\frac{1}{2}$ times the length of the shorter side, find the length of the longer side. [3]

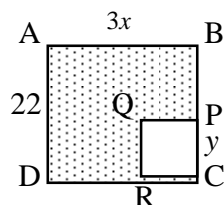
13. ABCD is a square of side 22 cm and PQRC is a square of side y cm. The shaded area is 403 cm^2 . Find the value of

(a) x ,

[1]

(b) y .

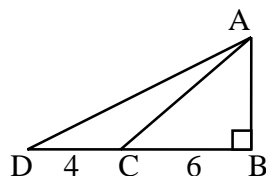
[3]



14. In the figure, the area of $\triangle ACD$ is 8.4 cm^2 . Calculate

(a) the length of AB, [2]

(b) the area of $\triangle ABC$. [2]

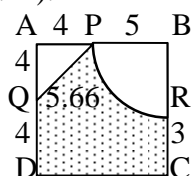


15. ABCD is a rectangle, Q is the mid-point of AD and BPR is a quadrant of a circle of radius 5 cm. Calculate

(a) the perimeter of the shaded area,

(b) the area of the shaded region. [6]

(Take $\pi = 3.14$).

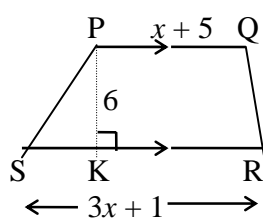


16. The radius of a car wheel is 35 cm. If the car is travelling at a speed of 90 km/h, find the number of revolutions made by the wheel in 5 minutes. [4]

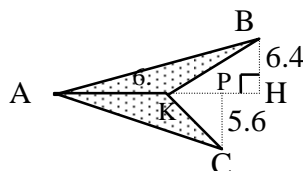
17. An athlete runs round a circular track 8 times, covering a distance of 4 km. Find the radius of the circular track, giving your answer in metres and correct to 2 decimal places. [4]

(Take $\pi = 3.142$)

18. The diagram shows a trapezium PQRS where PQ is parallel to SR. Given that $PQ = (x + 5) \text{ cm}$, $SR = (3x + 1) \text{ cm}$, $PK = 6 \text{ cm}$ and the area of PQRS is 66 cm^2 , find the value of x . [4]



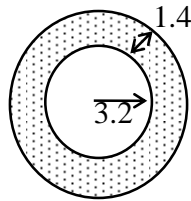
19. Calculate the area of the shaded region in the figure where $AK = 6.8 \text{ cm}$, $BH = 6.4 \text{ cm}$ and $CP = 5.6 \text{ cm}$. [3]



20. The diameter of a wheel is 28 cm. How many complete revolutions will it make after covering a distance of 52 m? [3]

21. The area of a circular man-made lake is 0.45 km^2 , find its diameter correct to the nearest m. [4]

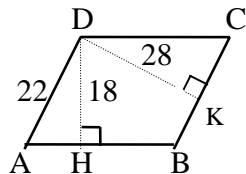
22. A circular pond of radius 3.2 m has a circular path 1.4 m wide around it. Find
 (a) the perimeter of the shaded region, [2]
 (b) the area of the concrete path. [2]



23. A room 15 m by 12 m is to be covered with carpets leaving a margin of 0.75 m all round. Find the cost of carpeting the room if the carpet is priced at \$35 per m^2 . [4]

24. The length and width of a rectangle are $5x \text{ cm}$ and $(4x - 3) \text{ cm}$. If the perimeter of the rectangle is 30 cm, find its area. [3]

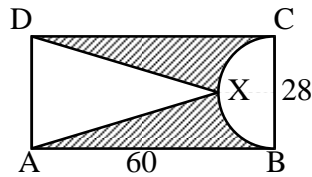
25. The diagram shows a parallelogram ABCD where $AD = 22 \text{ cm}$, $DH = 18 \text{ cm}$ and $DK = 28 \text{ cm}$. Calculate the perimeter of the parallelogram. [4]



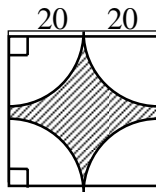
26. A wire circle of diameter 35 cm is bent to form a rectangle whose length is twice its width. Find the area of the rectangle. [4]

27. The length of a rectangle is $(3x + 4) \text{ cm}$ and its breadth is $(4x - 13) \text{ cm}$. If its perimeter is 94 cm, calculate
 (a) x , [3]
 (b) the area of the rectangle. [2]

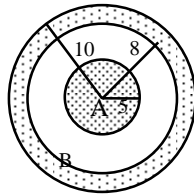
28. ABCD is a rectangle of length 60 cm and width 28 cm. ADX is a triangle and BXC is a semi-circle. Find the total area of the shaded parts. [5]



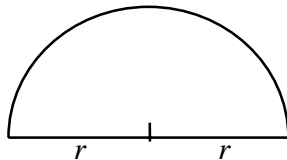
29. The shaded region is formed by cutting away four quarters of a circle of radius 20 cm from a square of side 40 cm. Find
 (a) the perimeter of the shaded region, [2]
 (b) the area of the shaded region. [2]



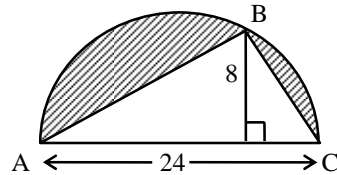
30. The diagram shows three concentric circles of radius 5 cm, 8 cm and 10 cm. Find the area of the region
 (a) A, [2]
 (b) B. [3]



31. A farmer used 216 m of fencing to fence up a semi-circular plot of land as shown in the diagram.
 (a) Find the radius of this plot of land. [2]
 (b) A goat requires a space of 3.3 m^2 to move about in the field. What is the maximum number of goats the farmer can put in the field? [3]

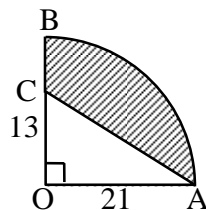


32. ABC is a semi-circle with diameter 24 cm. Calculate the area of the shaded region.
(Take $\pi = 3.142$) [4]

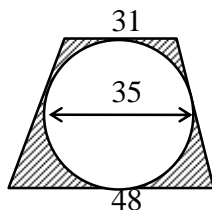


33. The radius of a circular piece of cardboard is measured as 1.25 m correct to the nearest cm. Find
(a) the largest possible radius, [1]
(b) the smallest possible area, giving your answer correct to 4 significant figures. [4]
(Take $\pi = 3.142$)

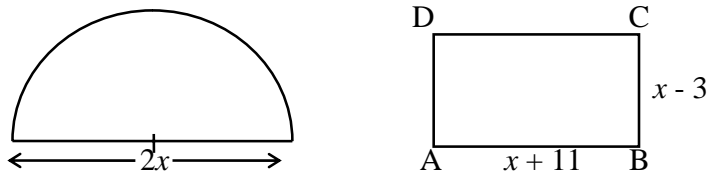
34. The figure shows a quadrant of a circle OAB of radius 21 cm. If OC = 13 cm, calculate the area of the shaded region. [4]



35. A circle of diameter 35 cm is enclosed in a trapezium with parallel sides of length 31 cm and 48 cm. Calculate the area of the shaded region. [3]

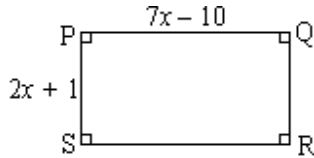
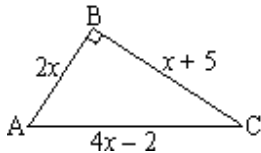


36. The perimeter, in cm, of the semi-circle is equal to the perimeter of the rectangle.
(a) Form an equation and find the value of x . [4]
(b) Which figure has a larger area? Find the difference in the area. [3]



37. A rectangular courtyard 25 m long and 12 m wide is to be paved with square slabs of side 25cm.
- How many slabs can be placed in a row along its length?
 - How many such rows will be needed ?
 - How many slabs will be needed to pave the whole courtyard ?
 - If one slab costs \$0.74, find the total cost of paving the courtyard. [6]

38.

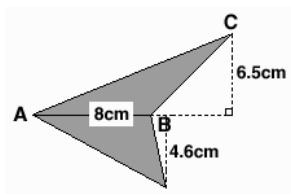


The perimeter of the rectangle PQRS is $1\frac{1}{2}$ times that of the perimeter of the triangle ABC. Form an equation in x and hence find the perimeter and area of the triangle. What is the difference between the area of the triangle and that of the rectangle? [6]

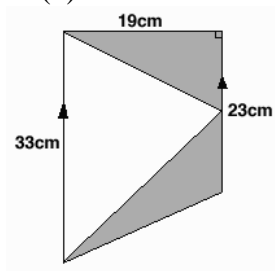
39. The diameter of a bicycle wheel is 80 cm. How many complete revolutions has it made after covering a distance of 4.5 km? (Take $\pi = 3.14$) [3]
40. A piece of wire 40 cm in length is bent to form a semicircle. Find its radius and area. (Take $\pi = 3\frac{1}{7}$.) [4]
41. The area of a square is 900 cm^2 . Find the perimeter of the square. [3]
42. The diameter of a car wheel is 70 cm. If the car is travelling at 55 km/h, find the number of revolutions made by the wheel in 90 seconds. (Take $\pi = 3\frac{1}{7}$) [3]

43. Calculate the area of the shaded regions in the given figures.

(a)



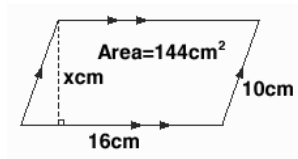
(b)



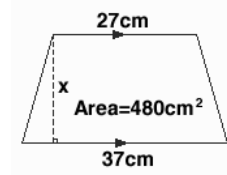
[6]

44. Find the value of x in each of the given figures.

(a)



(b)

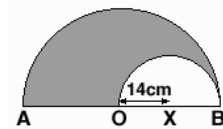


[6]

45. In the figure, OB is the radius of the big semicircle and XB is the radius of the small semicircle. Given that $OX = 14$ cm, calculate the area and the perimeter of the shaded region in the figure.

(Take $\pi = 3\frac{1}{7}$.)

[3]



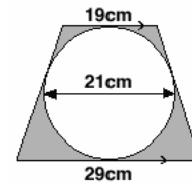
46. Calculate the cost of spraying a rectangular field 720 m by 500 m with pesticide at a cost of \$23.50 per hectare.

[3]

47. Calculate the area of the shaded region in the given figure.

(Take $\pi = 3\frac{1}{7}$.)

[3]



48. The area of a rectangle is 11.6 m^2 . Calculate its perimeter if its width is 46.4 cm.

[3]

Answers

1. 10 cm

2. 336 cm²

3. (a) $35\frac{5}{7}$ cm (b) $78\frac{4}{7}$ cm²

4. (a) 125.6 cm (b) 376.8 cm²

5. (a) 40 cm² (b) 40 cm²

6. (a) 24 cm (b) 384 cm²

7. 254

8. 18.0075 m²

9. 144 cm²

10. 21.8 cm

11. 10.24 cm²

12. 35 cm, 25cm

13. (a) 7 (b) 9

14. (a) 4.2 cm (b) 12.6 cm²

15. (a) 29.51 cm (b) 44.375 cm²

16. 3409

17. 79.56 m

18. 4

19. 40.8 cm²

20. 59

21. 378 m

22. (a) 48.98 m (b) 34.29 m²

23. \$4961.25

24. 50 cm^2

25. $112\frac{4}{9} \text{ cm}$

26. $672\frac{2}{9} \text{ cm}^2$

27. (a) 8 (b) 532 cm^2

28. 924 cm^2

29. (a) $125\frac{5}{7} \text{ cm}$ (b) $342\frac{6}{7} \text{ cm}^2$

30. (a) $78\frac{4}{7} \text{ cm}^2$ (b) $113\frac{1}{7} \text{ cm}^2$

31. (a) 42m (b) 840

32. 130.224 cm^2

33. (a) 1.255m (b) 4.870 m^2

34. 210 cm^2

35. 962.5 cm^2

36. (a) 14 (b) semicircle, 33

37. (a) 100 slabs (b) 48 rows (c) 4 800 slabs (d) \$3 552

38. $1\frac{1}{2}(7x + 3) = 2(9x - 9); x = 3, P = 24 \text{ cm}, A = 24 \text{ cm}^2, 53 \text{ cm}^2$

39. 1 791

40. $7\frac{7}{9} \text{ cm}; 95\frac{5}{81} \text{ cm}^2$

41. 120 cm

42. 625

43. (a) 44.4 cm^2 (b) 218.5 cm^2

44. (a) $x = 9$ (b) $x = 15$

45. 924 cm^2 , 160 cm

46. \$846

47. 157.5 cm^2

48. 50.928 m

Chapter 9

Secondary 1 Mathematics
Chapter 9 Volume and Surface Area

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 209)

They are of equal weight.

Just For Fun (pg 209)

A cube of side 647 m. ($\sqrt[3]{(5 \times 10^9) \times (5.4 \times 10^{-2})}$)

Just For Fun (pg 208)

Fill the 3-l jar and pour the water into the 5-l jar. Fill up the 3-l jar again and top up the 5-l jar. This means 1 litre of water remains in the 3-l jar. Pour the water in the 5-l jar back to the tank and pour the 1 litre of water from the 3-l jar into the 5-l jar. Fill the 3-l jar and add these 3 litres of water to the 1 litre of water in the 5-l jar and you will have 4 litres of water.

Exploration (pg 198)

6 cuts

1. $1 = (3 - 2)^3$
2. $6 = 6(3 - 2)^2$
3. $12 = 12(3 - 2)$
4. 8 = the 8 edges
5. 0 = not possible

9 cuts

1. 0 = not possible
2. 8 = the 8 edges
3. $24 = 12(4 - 2)$
4. $24 = 6(4 - 2)^2$
5. $8 = (4 - 2)^3$

You may want to lead pupils to investigate for the case of a cube with side n cm and to find the number of faces with

- | | |
|----------------------------|-------------------------------|
| (1) no painted faces, | (2) 1 face painted green, |
| (3) 2 faces painted green, | (4) 3 faces painted green and |
| (5) 4 faces painted green. | |

Secondary 1 Mathematics

Chapter 9 Volume and Surface Area

GENERAL NOTES

Students should now be familiar with finding volume of cubes and cuboids, having learnt the methods at primary level. You may like to begin the lesson on this chapter by asking them to name the common units used to measure the capacity of soft drink cans, car engines, the amount of water in a reservoir, the volume of the school hall and so on. In addition, students may be asked to name a way of measuring the volume of one's body.

You may encourage your students to find out what other units of volume are still in use today from newspaper reports or labels of imported products. For example, it was reported in June 1991 that Singaporeans consume about 230 million gallons of water a day. In 1998, Singapore's population of 3.9 million users consume an average of 1.21 million cubic metres of water per day.

When you come to the section on volume and surface area of cylinders, you may wish to ask them why lots of canned drinks are cylindrical in shape, why petrol tanks and cement mixers are almost cylindrical or spherical in shape. Many varied and interesting responses should be expected. Most students may not have realised that cylindrical or spherical containers need the least material for construction at a given capacity.

Common Errors Made By Students

- (1) Failure to identify the correct area of cross-section of a given shape or object.
- (2) Missing out certain surface areas of composite shapes or objects when calculating the total surface area.
- (3) Forgetting to change given units of measurement to a common unit in their calculations.
- (4) Not using the formula, $\text{density} = \frac{\text{mass}}{\text{volume}}$ correctly.

NE MESSAGES

No one owes Singapore a living. We must find our own way to survive and prosper.

Page 200 Ex. 9a Q8

Singapore is a small island country with limited land area. We have to make full use of our land. Thus we have to reclaim land, build underground caverns and high-rise buildings. Filling unused quarry is one of the options although the cost is high. (ST 1/5/1999 report Page 62-63)

Page 200 Ex. 9a Q9, Page 212 Ex. 9c Q10

To help Singapore ride out the economic crisis that hit the Asian countries in 1998, the government came up with a package of financial measures to help Singapore companies. These measures included a pay cut or pay freeze plus a 10% CPF cut in the employer's contribution. Other items included rent reduction and property rebates, etc. Singapore's economy is highly dependent on trade and services. To regain our competitive edge, we need to find ways and means to make our country a place where investors are willing to commit themselves to our economy. With the package in place, we had demonstrated to the world that Singaporeans are able to take hard decisions and the people are rational, rallied to the government's call in time of difficulty and united behind the government. The issue of voluntary pay cut is something unheard of in other countries. (ST 23/2/199 report Page 25)

Page 216 Review Questions 9 Q13

Singapore strives to be the leading convention and exhibition centre in the region. The building of the Singapore Expo to complement the existing Suntec Exhibition and Convention Centre and World Trade Centre will get us a step closer to this realisation. We need to find business opportunities for ourselves.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks:

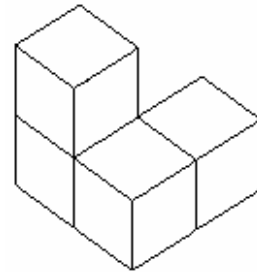


Secondary 1 Multiple-Choice Questions Chapter 9 Volume and Surface Area

1. A box is 2 m long, 1.5m wide and 1 m high. Calculate the total surface area of the box.
(A) 3 m^2 (B) 5 m^2 (C) 7 m^2 (D) 9 m^2 (E) 13 m^2 ()

2. The diagram on the right shows an object formed by gluing together the adjacent faces of four equal solid cubes of side 2 cm. The total surface area of the object is _____.

(A) 84 cm^2 (B) 80 cm^2 (C) 76 cm^2
(D) 72 cm^2 (E) 66 cm^2
()



3. Each side of a cube of length x cm is doubled to form a large cube. The number of cubes of side x cm needed to fill the larger cube is _____.
(A) 2 (B) 4 (C) 6 (D) 8 (E) 16 ()
4. A rectangular cuboid measures 6 cm by 9 cm by 18 cm. A second rectangular cuboid whose volume is half that of the first cuboid has a base area of 18 cm^2 . Find the height of the second cuboid.
(A) 108 cm (B) 54 cm (C) 27 m (D) 16 cm (E) 6 cm ()
5. A 1-litre water container is one quarter full of water. How much more water is needed to fill the container?
(A) 7.5 ml (B) 25 ml (C) 75 ml (D) 250 ml (E) 750 ml
()
6. The total surface area of a solid cylinder of radius 8 cm and height 14 cm is _____ cm^2 .
(A) 352π (B) 448π (C) 576π (D) 704π (E) 896π ()
7. The volume of a cube is 729 cm^3 . The total surface area in cm^2 is _____.
(A) 81 (B) 486 (C) 243 (D) $364\frac{1}{2}$ (E) $121\frac{1}{2}$ ()

8. If the total surface area of a thin hollow cube with lid is 972 cm^2 , then the volume of the box in cm^3 is _____.
 (A) 1458 (B) 972 (C) 729 (D) 1944 (E) 486 ()
9. The radius of a cylindrical pipe is 7 cm. What is the rate in cm per second at which water flows into the pipe if the water collected per second from the pipe is 220 cm^3 ?
 (A) $\frac{220}{7}$ (B) $\frac{10}{7}$ (C) $\frac{22}{7}$ (D) $\frac{7}{22}$ (E) $\frac{7}{10}$ ()
10. The largest number of boxes of total surface area, 24 cm^2 , that can be put into a larger box of total surface area 384 cm^2 is _____.
 (A) 18 (B) 16 (C) 24 (D) 64 (E) 384 ()

Answers

- | | | | | |
|------|------|------|------|-------|
| 1. E | 2. D | 3. D | 4. C | 5. E |
| 6. A | 7. B | 8. C | 9. B | 10. D |


XYZ SECONDARY SCHOOL

Name: _____ ()

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Class: _____

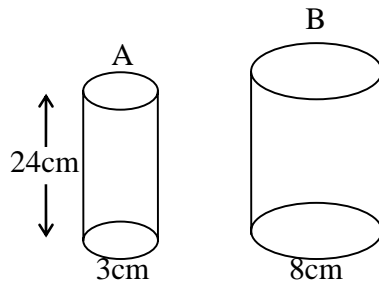
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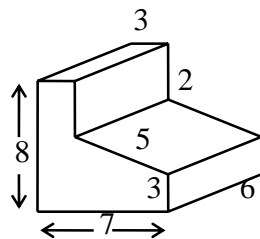
Secondary 1 Mathematics Test Chapter 9 Volume and Surface Area

1. A large rectangular conference room has length 12 m, breadth 9 m and its volume is 540 m^3 , find its height. [2]
2. Find the length of a rectangular box if the volume is 60 cm^3 , width 4 cm and height 2 cm. [2]
3. A cuboid is of length 4.2 m, breadth 1.4 m and height 1.2 m. Find the number of cubes, each of edge 20 cm, that can be cut from the cuboid. [2]
4. A solid metal cube of side 46 cm is melted and the molten metal is recast into cylindrical solids of diameter 4 cm and height 3.2 cm. How many such solids can be made? [3]
5. The mass of mercury in a glass cylinder of height 21 cm is 22.44 kg. If 1 cm^3 of mercury has a mass of 13.6 g, calculate the diameter of the glass cylinder. [4]
6. A rectangular piece of metal 4 cm wide, 3 cm thick and x cm long weighs 10.5 kg. If 1 cm^3 of the metal weighs 3.5 g, find x . [4]
7. Find the mass, in kg, of a cylindrical metal bar 3.2 m long and 7 cm in diameter, if the density of the metal is 4.8 g/cm^3 (i.e. 1 cm^3 of the metal weighs 4.8 g). [4]
8. A solid metal has a mass of 4.874 kg. Calculate its volume in cm^3 if the density of the metal is 5.7 g/cm^3 . [3]
9. The dimensions of a rectangular block of solid is in the ratio of 5 : 4 : 3. If the volume is equal to the volume of a cube of side 28 cm, find the length of the longest side of the cuboid, giving your answer correct to 1 decimal place. [3]
10. A rectangular solid cuboid of length 40 cm, width 25 cm and height 8 cm has a mass of 33.6 kg. Find its density in kg/m^3 . [3]

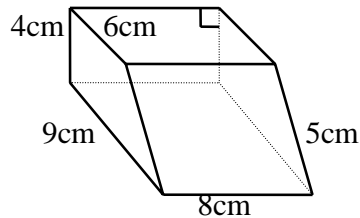
11. Initially cylinder A contains water to a height of 24 cm. This water is poured into cylinder B. Find the height of water in B after the transfer. [4]



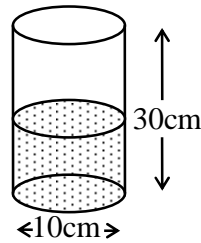
12. A solid cube of total surface area 384 cm^2 is made of metal of density 6.5 g/cm^3 . Calculate the mass of the solid. [4]
13. The radius of a solid rod is 6 cm. If the weight of the rod is 14.5 kg and the density of the rod is 3.8 g/cm^3 , find the length of the rod correct to the nearest cm. [4]
14. The circumference of a base of a solid cylinder is 88 cm and its height is 10 cm. Find the
 (a) total surface area of the cylinder, [3]
 (b) volume of the cylinder. [3]
15. A solid of mass 4.8 kg has a volume of 2880 cm^3 , find its density in g/cm^3 . [3]
16. The total surface area of a solid cube is 294 cm^2 , find the volume of the cube. [2]
 If the mass of the cube is 1.47 kg, find its density in kg/m^3 . [2]
17. In the figure, all dimensions are given in cm.
 Calculate (a) the total surface area,
 (b) the volume of the solid. [6]



18. The figure shows a solid with a trapezium as its area of cross-section. Find
- (a) its volume, [2]
 - (b) its total surface area, [3]
 - (c) its mass if the density of the solid is 2.8 g/cm^3 . [2]

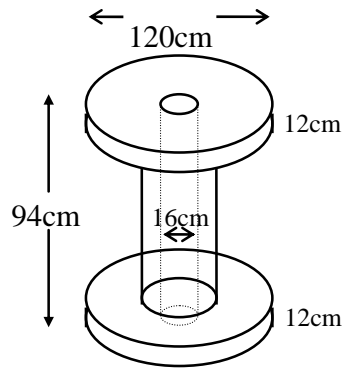


19. A cylinder is $\frac{3}{8}$ filled with water. After 8 similar ball bearings are added into the water, the water level rises to $\frac{1}{2}$ of the cylinder. Calculate the volume of each ball bearing. (Take $\pi = 3.14$). [4]



20. An open cylindrical tank of radius 14 cm and height 30 cm is to have its exterior surfaces painted.
- (a) Find the total surface area to be painted. [3]
 - (b) If it costs \$7.50 to paint an area of 1 m^2 , how much will it cost to paint the above tank? (Give your answer correct to the nearest cent.) [3]
21. A tank 1.1 m long, 60 cm wide and 40 cm high is $\frac{5}{8}$ full of a liquid.
- (a) How many extra litres of liquid is needed to fill up the tank? [2]
 - (b) How long will it take to fill up the tank if a tap fills it up at a rate of 5.5 litres per minute? [2]
 - (c) If the density of the liquid is 800 kg/m^3 , calculate the mass of the liquid in the whole tank, giving your answer in kg. [2]

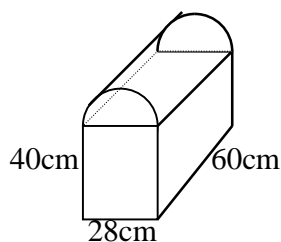
22. A wooden cable-drum consists of two cylindrical end pieces, each of radius 60 cm and thickness 12 cm, connected by a cylinder of radius 20 cm and length 70 cm. A circular hole of radius 8 cm passes centrally through the drum. Calculate the volume of wood used in making the drum. [5]
(Give your answer in terms of π .)



23. A rectangular piece of metal 12 cm by 18 cm by 10 cm is recast to make 45 cylindrical plates each of radius 1.2 cm. Find the thickness of each plate, giving your answer correct to 2 decimal places. [4]
(Take $\pi = 3.142$.)

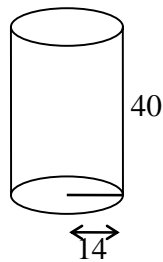
24. A cylindrical tank of radius 70 cm contains 385 litres of a liquid. Calculate the total surface area of the liquid in contact with the tank. If the density of the liquid is 800 kg/m³, calculate the mass of the liquid. [6]

25. The diagram shows a closed container made up of a cuboid joined by half of a cylindrical cover. The dimensions given are in cm. Calculate
(a) the volume of the container in litres, [3]
(b) the total surface area in m². [3]

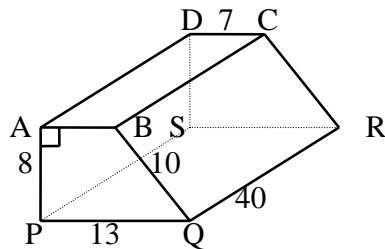


26. A 12-metre metal pipe has a thickness of 0.5 cm and an internal radius of 9 cm. Calculate (a) the volume of metal used in cm³, [3]
(b) the internal curved surface area of the pipe in m², [2]
(c) the mass of the metal if the density of the metal used is 3.75 g/cm³. [2]

27. A solid rectangular cuboid of length 30 cm, width 25 cm and height 15 cm is melted and the molten metal is recast into circular coins of radius 1.5 cm and thickness 2.4 mm. Calculate
- the total surface area of the cuboid, [2]
 - the number of coins that can be made, [2]
 - the volume of molten metal left behind, [2]
 - the weight of one of the coins if the density of the metal is 6.5 g/cm^3 . [2]
28. Water flows at 3.4 m/s through a pipe of internal diameter 5.2 cm. Find, correct to the nearest minute, the time required to fill a cylindrical tank of radius 2.3 m and height 1.6 m. [4]
29. A rectangular tank 4.2 m long and 1.8 m wide contains 3780 litres of a liquid.
- Find the depth of the liquid in the tank. [2]
 - 380 solid bricks are lowered into the tank and the water level rises by 1.6 cm. Find the volume of one block of brick. [2]
 - If the density of the liquid is 1.2 g/cm^3 and the density of the brick is 1.8 g/cm^3 , calculate the mass of the liquid and the bricks in the tank, giving your answer in kg, correct to 2 decimal places. [4]
30. The diagram shows a closed cylindrical container of radius 14 cm and height 40 cm. Calculate
- the volume of the container. [2]
 - 450 such containers are to be painted with paint which costs \$8.70 per litre. If 240 ml of paint can paint only 4200 cm^2 of surface, how many litres of paint must be purchased to paint all the 450 such containers? [4]



31. The diagram represents a solid block of wood. The faces of ABCD, APSD, PQRS, BCRQ are rectangular. ABQP and CDSR are trapeziums. Given that $AB = DC = 7$ cm, $AP = DS = 8$ cm, $PQ = SR = 13$ cm and $QR = PS = 40$ cm, calculate
- the area of ABQP, [2]
 - the volume of the block of wood, [2]
 - the total surface area of the solid block of wood. [3]

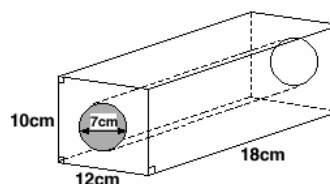


32. A tank has a length of 65 cm, breadth 42 cm and contains sugarcane juice to a height of 38 cm. How many complete cylindrical cups of radius 3.5 cm and height 12 cm can it fill? What is the volume of sugarcane juice left over? [5]
33. Water flows into a rectangular tank measuring 4 m by 2.5 m by 2.4 m through a cylindrical pipe of radius 4.2 cm. If the rate at which water flows through the pipe is 28 m/min, how long will it take, to the nearest minute, to fill the tank? [4]

For questions 34 to 43, take $\pi = \frac{22}{7}$ unless stated otherwise.

34. A cylindrical water container of diameter 28 cm and height 35 cm is $\frac{11}{14}$ full of water. How many glasses of water, each of volume 245 cm³, can be filled to the brim? What is the volume of water left over? [4]

35. The diagram on the right shows a rectangular block of wood with a cylindrical block of diameter 7 cm cut out from it.



- Find the original volume of the wooden block.
- Find the volume of the cylindrical block cut out from it.
- What is the volume of the remaining block of wood?

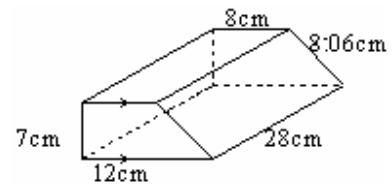
[6]

36. The volume of a solid cube is 125 cm³. Find the total surface area of the cube. [3]

37. The diagram on the right shows a block of wood 28 cm long with a uniform cross-section. Calculate

- the volume of the block,
- the total surface area of the block,
- the mass of the block if it has a density of 1.12 g/cm^3 .

[6]



38. A solid cylindrical block has a base radius of 14 cm and a height of 1.2 m.
- Calculate the total surface area of the block.
 - What is the volume of the block?
 - Calculate its density if the block has a mass of 92.4 kg. Give your answer in g/cm^3 .

[6]

39. A solid metal cylinder 8 cm in diameter and 12 cm long is melted and recast into a cylindrical rod of diameter 2 cm. What is the length of this rod? [3]

40. A rectangular tank 2.5 m by 1.8 m by 1.6 m contains water to a depth of 75 cm. How many full buckets of water are needed to fill the tank if each bucket contains 1.26 litres of water? [3]

41. The mass of mercury in a glass cylinder of height 14 cm is 2393.6 g. If the density of mercury is 13.6 g/cm^3 , calculate the diameter of the glass cylinder. [3]

42. The internal and external diameters of a hollow cylindrical pipe are 4.8 cm and 6 cm respectively. Find the volume of such a pipe of length 1.2 m. (Take $\pi = 3.14$.) [3]

43. Water flows into a rectangular tank which measures 4 m by 3 m by 2.8 m through a cylindrical pipe of radius 2.4 cm. If the rate at which the water flows into the tank is 8 km/h, find how long it takes to fill the tank. (Take $\pi = 3.14$.) [4]

Answers

1. 5 m

2. 7.5 cm

3. 882

4. 2419

5. 10 cm

6. 250

7. 59.136 kg

8. 8551 cm³

9. 35.8 cm

10. 4200 kg/m³

11. $3\frac{3}{8}$ cm

12. 3.328 kg

13. 34 cm

14. (a) 2 112 cm² (b) 6 160 cm³

15. $1\frac{2}{3}$ g/cm³

16. 343 cm³, 4286 kg/m³

17. (a) 252 cm² (b) 252 cm³

18. (a) 240 cm³ (b) 204 cm² (c) 672 g

19. 36.8 cm³

20. (a) 3256 cm² (b) \$2.44

21. (a) 99 (b) 18 minutes (c) 211.2 kg

22. 108384π
23. 10.61 cm
24. 26 400 cm², 308 kg
25. (a) 85.68 litres (b) 1.4616 m²
26. (a) 34 886 cm³ (b) 6.789 m³ (c) 130.82 kg
27. (a) 3150 cm³ (b) 6 628 (c) 1.34 cm³ (d) 11.03 g
28. 27 minutes
29. (a) 50 m (b) 318.3 cm³ (c) 4 753.73 kg
30. (a) 24 640 cm³ (b) 123, \$1 070.10
31. (a) 80 cm² (b) 3 200 cm³ (c) 1680 cm²
32. 224, 252 cm³
33. 2 hours 35 minutes
34. 69, 35 cm³
35. (a) 2160 cm³ (b) 693 cm³ (c) 1467 cm³
36. 150 cm²
37. (a) 1960 cm³ (b) 1121.68 cm² (c) 2195.2
38. (a) 11 792 cm² (b) 73 920 cm³ (c) 1.25 g/cm³
39. 192 cm
40. 3036
41. 4 cm
42. 1220.8 cm³
43. 2 h 19 min 20 sec

Chapter 10

Secondary 1 Mathematics
Chapter 10 Ratio, Rate and Speed

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 232)

4 minutes

Just For Fun (pg 236)

55 hours, 33 minutes and 20 seconds

Just For Fun (pg 239)

They are of the same distance from Singapore.

Secondary 1 Mathematics

Chapter 10 Ratio, Rate and Speed

GENERAL NOTES

In this chapter, **ratio** is introduced as an alternative way of comparing two quantities of the same kind and students will encounter the technique of increasing or decreasing a quantity in a given ratio. When you are teaching this technique, emphasise to your students that a number becomes **larger** when it is multiplied by **a factor greater than 1** and **smaller** when it is multiplied by **a factor less than 1**. Thus, to **increase** a quantity in a given ratio, we multiply it by the given ratio which is an **improper fraction**. To **decrease** a quantity in a given ratio, we multiply it by the given ratio which is a **proper fraction**. This may be of great help to your students if they prefer to use ratio method to solve problems involving rate.

An important reminder for students is to state the units used for rate whereas ratio does not involve unit. We normally use the word “per” or the symbol “/” to denote a rate or a speed, eg. \$12.50 per hour or 5 km/h.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks:

9

Secondary 1 Multiple-Choice Questions Chapter 10 Ratio, Rate and Speed

1. Peter, Paul and Robert each drive 120 km of a 360-km journey at speeds of 60 km/h, 80 km/h and 100 km/h respectively. Find the average speed for the whole journey and correct your answer to one decimal place.
(A) 80.6 km/h (B) 76.6 km/h (C) 45.0 km/h (D) 34.0 km/h
(E) 25.5 km/h ()
2. A company jointly owned by Simon and John made a profit of \$14 000 for the year. As the managing director of the company, John received \$4000 as bonus and the rest of the money was divided equally between them. What is the ratio of John's share to Simon's share?
(A) 2 : 5 (B) 5 : 2 (C) 5 : 9 (D) 9 : 5 (E) 14 : 5 ()
3. 8 workers can paint a building in 24 days. How many days will 18 workers take to paint the same building?
(A) 54 (B) $10\frac{2}{3}$ (C) $10\frac{1}{3}$ (D) $6\frac{2}{3}$ (E) 6 ()
4. A worker is paid \$5 an hour during normal working hours. He is paid \$7 an hour if he works overtime. How much is he paid if he works from 08 30 to 21 00 which includes 3 hours of overtime and two 45-minute breaks for lunch and dinner?
(A) \$55 (B) \$61 (C) \$68.50 (D) \$71 (E) \$77 ()
5. A room can just store either 10 cases of soya bean drink and 8 cases of fruit juice or 4 cases of soya bean drink and 11 cases of fruit juice. How many cases of soya bean drink have the same volume as one case of fruit juice?
(A) 2 (B) 3 (C) 6 (D) 15 (E) 18 ()
6. A tap can fill a bath in 12 minutes and another tap can do so in 24 minutes. How long will they take running together?
(A) 36 (B) 18 (C) 12 (D) 8 (E) $\frac{1}{8}$ ()

7. 50 kg of grade A coffee beans is mixed with 100 kg of grade B coffee beans. What will be the weight in kg of grade B coffee beans in 60 kg of the mixture?
(A) 10 (B) 20 (C) 40 (D) 50 (E) 60 ()
8. Peter can dig a drain in 4 days and John can dig one in 12 days. Both of them work together for 1 day and stop for 3 days after which they continue their work. If they start on Monday morning, when will the job be completed?
(A) Saturday morning (B) Saturday night (C) Friday night
(D) Friday morning (E) Thursday morning ()
9. Mr Lim, working alone, takes 20 days to complete a job. Mr Tan, working alone, takes 15 days to complete the same job. If Mr Lim and Mr Tan work on the job together for 6 days, what fraction of the job would be left?
(A) $\frac{1}{5}$ (B) $\frac{3}{5}$ (C) $\frac{29}{35}$ (D) $\frac{3}{10}$ (E) $\frac{7}{10}$ ()

Answers

- | | | | | |
|------|------|------|------|------|
| 1. B | 2. D | 3. B | 4. B | 5. A |
| 6. D | 7. C | 8. B | 9. D | |


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks: 

Secondary 1 Mathematics Test Chapter 10 Ratio, Rate and Speed

1. (a) Express the ratio 15 seconds : 2 minutes as a single fraction in its lowest terms. [1]
(b) When a is multiplied by 1.75 it becomes b . Express $a : b$ as a ratio in its simplest form. [1]
2. A number of stamps was shared between Peter and Paul in the ratio 4 : 9. If the stamps were shared in the ratio 9 : 4 instead, Peter would receive 45 stamps more. Find the number of stamps to be shared. [3]
3. A sum of money is divided among John, Joshua and Raymond in the ratio 3 : 7 : 11. If Raymond has \$168 more than John, find the sum of money. [2]
4. In the manufacture of an article, the cost of labour, materials and overheads are in the ratio 9 : 5 : 3. If the total cost is \$918, find the cost of labour. [2]
5. (a) If 0.035 grams of preservative is added to one litre of fruit juice, calculate the mass of preservative in 800 litres. [2]
(b) A car travels 84 km in $1\frac{3}{4}$ hours and then travels at a constant speed of 36 km/h for a further $1\frac{1}{4}$ hours. Calculate
 - (i) the average speed for the first $1\frac{3}{4}$ hours, [1]
 - (ii) the average speed for the whole journey. [1]
6. A farmer intends to grow cabbage and lettuce in a field. Planting a row of cabbage costs \$50 and planting a row of lettuce costs \$40. In addition, a row of cabbage takes 2 man-days while a row of lettuce takes 5 man-days.
 - (a) The farmer intends to plant 7 rows of lettuce and 4 rows of cabbage.
 - (i) How long will it take him, working alone, to complete the job? [1]
 - (ii) How much will it cost? [1]
 - (b) If the farmer has only \$610 to spend and he intends to plant 3 rows of lettuce and a number of rows of cabbage, what is the maximum number of rows of cabbage he can plant? [2]

7. (a) Divide 255 m in the ratio 3 : 7 : 7 : 10. [2]
 (b) A man earns \$576 in a 6-day week. What is his pay for 4 days? [1]
 (c) Four men renovate an office in 21 days. How long would it take seven men? [2]
8. (a) An alloy of copper and tin weighs 176 kg. The ratio of the weight of copper to that of tin in the alloy is 5 : 6. Find the weights of copper and tin in the alloy. [2]
 (b) Five men can repair a stretch of road in 8 hours. How many men would be needed to repair the same stretch of road in $3\frac{1}{3}$ hours? [2]
9. A train travelling at 108 km per hour goes through a tunnel 1770 metres long. Calculate, in seconds, how long the train is inside the tunnel. [3]
10. Robert, George and Edwin are required to make 1650 articles in the ratio 5 : 8 : 9.
 (a) How many articles are Robert and Edwin supposed to make respectively? [2]
 (b) If they earn 65 cents per article made, how much will George receive? [2]
 (c) If Peter is asked to help to make 125 articles for each of them, find the ratio of the number of articles actually made by Robert, George and Edwin. [3]
11. (a) How far can a car travel on 18 litres of petrol if it can travel 143 km on 11 litres? [1]
 (b) A man parks his car at 09 45 and collects it at 15 05 on the same day.
 (i) How long was his car in the car park? [1]
 (ii) Parking charges are at the rate of \$2 for the first 1 hour and 90 cents for each half hour or part of a half hour after the first hour. How much must he pay for this day's parking? [2]
12. (a) A car is travelling at a speed of 25 metres per second. Express its speed in kilometres per hour. [1]
 (b) 48 pencils are shared among Yin Yin, Ruby and Jane in the ratio 2 : 5 : 9. Find the difference between Yin Yin's share and Jane's share. [2]
 (c) If 8 men can paint a school in 15 days, how many days would it take 12 men to paint a similar school, assuming that they work at the same rate? [2]
13. A rectangular piece of land measures 4.5 km long and 2.5 km wide.
 (a) Calculate the ratio of
 (i) its width to its length, [1]
 (ii) its length to its perimeter. [1]
 (b) If the land was bought at a price of \$200 000 per square kilometre, calculate the total cost of the land, giving your answer correct to the nearest \$100 000. [3]

14. The floor of a room is to be made of concrete. The concrete is to be made of cement, sand and stone in the ratio by weight of 1 : 2 : 4. Given that 0.505m^3 of concrete is required and 1 m^3 of concrete weighs 2520 kg, find the number of 50 kg bags of cement needed to make the required concrete. [3]
15. A school spends \$12 880 on overhead projectors some of which cost \$350 each and some \$560 each. Find how many of each kind are bought if the ratio of the money spent on the dearer projectors to that spent on the cheaper projector is 8 : 15. [3]
16. A man left a legacy of \$9450 to be divided among his four daughters in the ratio 5 : 6 : 7 : 9. Find how much each received. [3]
17. (a) Express 1 hour 45 minutes after 10.47 pm in 24-hour time. [1]
 (b) Express 35 metres per second in kilometres per hour. [1]
 (c) At what time will John arrive at school which is 5.6 km away if he starts his journey at 06 57 and travels at 4.8 km per hour? [2]
18. Mr Lim spends an average of \$182 on fresh fish per month. His average monthly expenditure on fish will be reduced in the ratio 7 : 4 if he buys frozen fish instead of fresh fish. How much money will be saved per month if he buys only frozen fish? [2]
19. Last month my local call meter read 12 526 units. This month it reads 12 928 units.
 (a) How many units did I use over the month? [1]
 (b) If I pay \$0.007 per unit used and \$25 for the rental charge of a direct exchange line for three months, how much must I pay for the use of telephone last month? [3]
20. (a) If a car is travelling at 24 metres per second, calculate its speed in km per hour. [1]
 (b) The car travelling from Town A to Town B at 24 metres per second takes $2\frac{1}{2}$ hours to arrive at Town B. Given that the petrol consumption of the car is 12 km per litre, calculate the petrol consumption in litres for the journey. [2]
 (c) Calculate the cost of petrol for the journey if 1 litre of petrol costs \$1.25. [1]
21. A train leaves Station A at 10.56 pm and arrives at Station B 1 hour 32 minutes later. Find
 (a) the time at which the train arrives in Station B, expressing your answer in 24-hour time, [2]
 (b) the speed of the train if the distance between Station A and Station B is 161 km. [1]

22. A cube of side 6 cm is made of an alloy consisting of two metals X and Y.
- Given that the ratio of the volume of X to that of Y is 3 : 5, find the volume of Y in the cube. [2]
 - Metal X weighs 6.48 grams per cm^3 and metal Y weighs 4.32 grams per cm^3 . Calculate, for this alloy, the ratio of the mass of metal Y to that of metal X. [2]
 - Find the mass of the cube, giving your answer in kg correct to three significant figures. [2]
23. (a) A bus travels at a constant speed of 52 km per hour. Calculate, in metres, the distance travelled by the bus in 27 seconds. [2]
- (b) 1232 cattle can finish a consignment of fodder in 108 days. Given that cattle eat the fodder at a constant rate, find the number of days an equal consignment of fodder feeds 1188 cattle. [2]
24. The cost of manufacturing a car was made up of wages, raw materials, electricity and factory maintenance in the ratio 16 : 7 : 4 : 1.
- At the beginning of 1996 the total cost of manufacture of a car was \$9800. Find the difference in the labour cost and the cost of raw materials. [2]
 - During 1996, the total cost of manufacture of a car increases by \$1080. The increase is made up of wages, raw materials, electricity and factory maintenance in the ratio 2 : 1 : 3 : 3. Calculate, for the new total cost of manufacture of a car, the ratio cost of electricity : cost of factory maintenance, giving your answer in the form $n : 1$. [3]
25. Visitors to an exhibition were charged \$10 each on the first day, \$6.50 on the second, \$4.50 on the third, and the total attendances on the three days were in the ratio 4 : 7 : 13. Find the average charge per person for the whole exhibition. [3]
26. (a) A contractor estimated that he needed 15 men to build a wall in 12 days, but he was asked to complete the work in 9 days. How many more men would he have to hire, assuming the same rate of working? [2]
- (b) Peter leaves his home at 06 40 and travels in his car at an average speed of 64 km per hour to his destination 240 km away.
- At what time does he arrive at his destination? [2]
 - On the return journey he leaves at 14 37 and reaches home at 7:25 pm. Calculate for the return journey the time taken and the average speed. [2]
27. (a) A tuition teacher charges \$124 for a tuition session lasting $2\frac{1}{2}$ hours. How much should he charge for one lasting $3\frac{3}{4}$ hours, if charges are made at the same hourly rate? [2]
- (b) A man walks 1125 metres in 25 minutes. Find his walking speed, giving your answer in km per hour. [2]

28. In a factory 450 workers each working for 48 hours can produce a total of 5400 articles. Find how many more workers, working at the same rate, would have to be employed in order to produce 7040 articles, if the working time for each worker is reduced to 44 hours. [4]
29. (a) \$540 is divided among three brothers in the ratio $\frac{3}{4} : \frac{2}{3} : \frac{5}{6}$. Find the amount each of them receives. [2]
 (b) A factory worker is paid \$5.60 an hour and \$8 an hour if he works overtime. How much is he paid for 11 hours of work of which $4\frac{3}{4}$ hours is overtime? [2]
 (c) 2 gardeners can mow a field in 3 days. If it is to be mowed in half a day, how many gardeners are needed? [2]
30. An alloy, *A*, contains copper and zinc in the ratio 2 : 3. An alloy, *B*, contains copper and tin in the ratio 13 : 7. Find
 (a) the ratio of copper, zinc and tin in a new alloy containing equal weights of *A* and *B*.
 (b) the weight of copper and of zinc in the new alloy given that the new alloy weighs 440 kg. [4]
31. A man bought 15 hens at \$4.80 each. In one year, they laid 3120 eggs which he sold at \$1.50 for every 10 eggs. The cost of feeding them for that year was \$180. At the end of that year, he sold 12 surviving hens at \$3 each. Find his overall profit. [3]
32. Liying, Zhifu and Guoliang have their birthdays in the same month. They were given a sum of money to be divided in proportion to their ages which are 8 years, 7 years and 5 years, respectively. Given that Liying and Zhifu together obtained a total of \$270, find the sum of money to be divided. [3]
33. (a) The perimeter of a quadrilateral is 108 cm. The sides of the quadrilateral are in the ratio 2 : 3 : 6 : 7. Calculate the length of the longest side.
 (b) The sides of a triangle are in the ratio 3 : 4 : 7. The length of the shortest side of the triangle is 18 cm. Find the perimeter of the triangle. [4]
34. A man set off in his friend's car on a 182-km journey at 10.55 a.m. The car broke down after it had travelled 153 km at an average speed of 54 km/h. Twenty minutes later, he was given a lift by a motorist who brought him to his destination at an average speed of 87 km/h. Calculate
 (a) the time at which he arrived at his destination,
 (b) the average speed at which he travelled for the whole journey. [5]

35. In making pineapple jam, water is added to 6 kg of pineapples and 9 kg of sugar until the total weight of the mixture is $16\frac{2}{3}$ kg. The mixture is then boiled for 2 hours to get 15 kg of pineapple jam. Calculate
- (i) the ratio of weight in which the pineapple, sugar and water are mixed,
(ii) the ratio of the total weight lost during the boiling process to the original weight of the mixture.
 - Given that the pineapples cost \$0.80 per kg, the sugar costs \$1.20 per kg and the heating cost is \$0.45 per hour, calculate the cost per kg of the pineapple jam. [5]
36. A bus travels from village P to village S via village Q and village R . The distances PQ , QR and RS are in the ratio $2 : 5 : 4$ and times taken to travel these distances are in the ratio $4 : 7 : 6$. Given that the time taken for the whole journey is $3\frac{2}{5}$ hours and that village Q is 42 km away from village P , calculate
- the times taken to travel distances PQ , QR and RS ,
 - the distances QR and RS ,
 - the average speed, in km/h, for the whole journey and give your answer correct to 3 significant figures,
 - the ratio of the average speeds for each section of the journey. [8]
37. If 6 printing machines can print 200 copies of a book in $1\frac{1}{2}$ hours, how long will 8 similar printing machines take to print 800 copies of the same book? [3]
38. The following is an extract from a bus time-table.
Given that the buses leave the bus station every 10 minutes and take the same time to complete the journey,
- | | |
|--------------------|-------|
| Bus Station | 06 30 |
| Ratio Street | 06 40 |
| Rate Tower | 06 44 |
| Proportion Park | 06 50 |
| Integer Hall | 06 56 |
| Fraction Street | 07 00 |
| Decimal Street | 07 11 |
| Mathematics School | 07 20 |
- how long does a bus take to travel from
 - Ratio Street to Decimal Street?
 - Rate Tower to Fraction Street?
 - Integer Hall to Mathematics School? [3]
 - at what time will the 7 o'clock bus arrive at
 - Proportion Park?
 - Decimal Street? [2]
 - Mr Ma has an appointment with Mr Li at Integer Hall at 09 00. Which bus must he take from the bus station to arrive on time for his appointment? [2]

Answers

1. (a) $\frac{1}{8}$ (b) 4 : 7
2. 117
3. \$441
4. \$486
5. (a) 28 g (b) (i) 48 km/h (ii) 43 km/h
6. (a) (i) 43 man-days (ii) \$480 (b) 9
7. (a) 45m, 105m, 105m, 150m (b) \$384 (c) 12 days
8. (a) 80kg, 96kg (b) 12 men
9. 59 seconds
10. (a) 375, 675 (b) \$390 (c) 10:19:22
11. (a) 234 km (b) (i) 5 hours 20 minutes (ii) \$10.10
12. (a) 90 km/h (b) 21 pencils (c) 10 days
13. (a) (i) 5 : 9 (ii) 9:28 (b) \$2 300 000
14. 4 days
15. 8 dearer projectors, 24 cheaper projectors
16. \$1750, \$2100, \$2450, \$3150
17. (a) 00 32 (b) 126 km/h (c) 08 07
18. \$78
19. (a) 402 units (b) \$11.15
20. (a) 86.4 km/h (b) 18 litres (c) \$22.50
21. (a) 0028; the next day (b) 105 km/h
22. (a) 135 cm³ (b) 10:9 (c) 1.11kg

23. (a) 390 metres (b) 112 days
24. (a) \$3150 (b) 2.5:1
25. \$6
26. (a) 5 more (b) (i) 1025 (ii) 4 hours 48 minutes, 50km/h
27. (a) \$186 (b) 2.7 km/h
28. 190 workers
29. (a) \$180, \$160, \$200 (b) \$73 (c) 12
30. (a) 21 : 12 : 7 (b) 231 kg, 132 kg
31. \$252
32. \$360
33. (a) 42 cm (b) 84 cm
34. (a) 2.25 p.m. (b) 52 km/h
35. (a) (i) 18 : 27 : 5 (ii) 1 : 10 (b) \$1.10
36. (a) 48 min, 84 min, 72 min (b) 105 km, 84 km
- (c) 67.9 km/h (d) 21 : 30 : 28
37. $4\frac{1}{2}$ hours
38. (a) (i) 31min (ii) 16 min (iii) 24 min
- (b) (i) 07 20 (ii) 0741 (c) 08 30bus

Chapter 11

Secondary 1 Mathematics
Chapter 11 Percentages

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg250)

50. If the girl makes up 2% of all the people in the theatre, there are $\frac{98\%}{2\%} = 49$ boys.
 \therefore 50 boys must leave.

Secondary 1 Mathematics

Chapter 11 Percentages

GENERAL NOTES

In this chapter, the very useful and important notion of percentage is introduced. The presentation includes varied applications of percentage, profit and loss, discount, commission, simple interest, hire purchase and taxation.

To help your students appreciate the importance and wide applications of percentage in everyday life, you may ask them to collect percentage figures from newspapers, magazines, books and articles to discuss their uses. You can point out to them instances in which percentage figures give a better picture. For example, consider a student who obtains 35 marks out of a total of 50 marks in one subject and 56 marks out of 80 marks in another subject. The percentage marks will show clearly which subject the student has performed better in.

You may need to emphasize that one percent means one hundredth ($\frac{1}{100}$), two percent means two hundredths ($\frac{2}{100}$), and so on. A basic misunderstanding of the meaning of per cent may result in students having difficulties in applications of percentage.

Percentage is a ratio whose denominator is 100. The technique of increasing or decreasing quantity in a given ratio is used in solving percentage problems. After an increase of 5%, a quantity x becomes

$$y = \frac{105}{100} \times x. \quad \begin{bmatrix} x \leftrightarrow 100 \\ y \leftrightarrow 105 \end{bmatrix}$$

On the other hand, after a decrease of 5%, the quantity x becomes

$$y = \frac{95}{100} \times x. \quad \begin{bmatrix} x \leftrightarrow 100 \\ y \leftrightarrow 95 \end{bmatrix}$$

The above concept is applied to percentage profit and loss as well as to discounts.

Common Errors Made By Students

Emphasise to your students that identifying the original quantity correctly and always setting it as 100% is crucial in avoiding common errors which are illustrated in the following examples.

- (1) Given that the cost of hiring a car for 4 days in 1990 was \$264 which was 20% more than it was in 1989, \therefore the cost of hiring a car for 4 days in 1989 = 80% of \$264.
- (2) Given that the price of a book is \$13.60 after a reduction of 20% on the usual selling price,
 - (a) the usual selling price = 120% \times \$13.60;
 - (b) the usual selling price = 80% \times \$13.60.

(3) A shopkeeper reduces the price of an article by 15%. Given that the usual price of the article is \$96,

\therefore the new selling price = 15% \times \$96.

Point out to your students that the original quantity in (1) is the cost of hiring a car in 1989 and not the cost of hiring a car in 1990. Thus the cost in 1989 should be taken as 100% and the cost in 1990 as 120%. This gives

$$\text{the cost of hiring a car in 1989} = \frac{100}{120} \times \$264. \quad \left[\begin{array}{l} \$x \leftrightarrow 100\% \\ \$264 \leftrightarrow 120\% \end{array} \right]$$

In (2), the original quantity is the usual selling price and is taken as 100%.

The new selling price after a discount of 20% is then taken as 80%.

$$\therefore \text{the normal selling price} = \frac{100}{80} \times \$13.60. \quad \left[\begin{array}{l} \$x \leftrightarrow 100\% \\ \$13.60 \leftrightarrow 80\% \end{array} \right]$$

In (3), the new selling price should be (\$96 – 15% \times \$96) or simply 85% \times 96.

You may also need to remind your students of the following:

$$\begin{aligned} \text{(i) \% increase} &= \frac{\text{amount of increase}}{\text{original amount}} \times 100\% \\ &= \frac{\text{new amount} - \text{original amount}}{\text{original amount}} \times 100\% \end{aligned}$$

(ii) A boy receives 20% more pocket money in 1991 than in 1990. Given that he receives \$24 per week in 1991, the amount of money he receives per week in

$$1990 = \frac{100}{120} \times \$24 \text{ and not } \$24 - \$24 \times \frac{20}{100}.$$

(iii) When an article is priced at \$10 and sold at a discount for \$8.50, the discount given is 15% and not 85%.

(iv) 14 years 2 months = $14\frac{1}{6}$ years and not 14.2 years.

You may wish to use the following worksheet to teach money exchange. In it, there is scope for the teacher to elaborate on interest rate, foreign exchange trade and speculation as well as the risk involved. If the rate to be calculated is based on the selling rate when we buy foreign currencies and to sell at the buying rate given by the bank, there is a strong likelihood that there will be a loss at the end of the day. And that is why before we visit a foreign country, it is wise to exchange just enough foreign currencies for our use as the process of exchanging from one currency to another and back again will normally result in a loss to us.

Money Exchange

Each of you will help invest \$100 000 in foreign currencies over the next three months. You are to use your foresight and prediction so as to select the best currency/currencies that will add value to the original sum.

The following are the rates of currencies for your reference.

CURRENCY	RATE AT MAY'90	RATE AT MAR'95	RATE AT 15/7/95	INTEREST RATE
US dollar	1.8825	1.4200	1.4041	5.25
Sterling pound	3.0686	2.3305	2.2456	6.125
Australian dollar	1.4203	1.0560	1.0332	6.75
New Zealand dollar	1.0895	0.9273	0.9573	7.875
Canadian dollar	1.6249	1.0070	1.0380	5.625
Malaysian ringgit	0.6946	0.560583	0.574263	5.0
Indonesian rupiah	0.001083	0.000645	0.000633	15.0
Japanese yen	0.011889	0.015763	0.015991	0.125
Thai baht	0.073491	0.057896	0.057118	7.75
French franc	0.3361	0.290689	0.290976	6.5

You are to make careful investments based on the above information. Enter into the following table your investments based on the exchange rates quoted on 15/7/1995 and the interest rates given.

CURREN CY	AMOUN T INVEST ED	SING\$ EQUIVALE NT	INTERES T EARNED	AMOUNT AT 15/10/1995	SING\$ EQUIVALE NT

Note: Of the 43 students in a class who tried this activity, 12 students made a profit and the rest suffered a loss from investing in the various currencies.

You may like to mention the findings of the Stock Exchange of Singapore (SES) that of all the CPF investors in the SES, only 1 in 5 managed to make a profit for the year 1994. If you wish to convey the message that it may not be wise to make quick money by taking risks, the above figures would be strong evidence.

The interest rate charged by credit card companies for outstanding amounts due to them is at an annual rate of 24%. Get the students to work out the amount due if \$5000 is not paid for 5 years.

NE MESSAGES

Page 251 Q2

Ask pupils if they have been to the National Heritage Board, Battle Box or Singapore Discovery Centre. Tell them that they can obtain good historical facts from visits to these places.

Page 261 Value-added Tax and GST

Ask pupils if they know why we have all these taxes. Are the tax rates too high or too low? Where does the money go? Ask pupils to find out. The government has studied these tax rates carefully so that they are competitive enough to draw investors to the country. You can discuss the merits of CPF system. What are the rates that employees and employers have to contribute at present?

Page 404 Revision Exercise IV No. 4 Q3b

Water is a precious commodity. Singapore has been searching for alternative sources. The investment and construction of a desalination plant is an option that the government may undertake. You may discuss the issue of water wastage and water conservation with pupils. Encourage them to save and not waste water.


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: 35 min

Marks: 

Secondary 1 Multiple-Choice Questions Chapter 11 Percentages

1. Abel bought a mini hi-fi set for \$600. He sold it to Bob at a loss of 20%. Bob sold it to Charles and made a profit of 5%. How much did Charles pay for it?
(A) \$456 (B) \$504 (C) \$684 (D) \$750 (E) \$756 ()
2. A man bought x balloons at y cents each. He sold all of them at z cents each. If x , y and z are all increased by 10%, find the percentage increase in profit.
(A) 10% (B) 15% (C) 21% (D) 30% (E) 40% ()
3. After the price of fuel went up by 10%, a man reduced his fuel consumption by 10%. What is the percentage change in his fuel bill?
(A) decreased by 1% (B) increased by 1% (C) increased by 9%
(D) decreased by 9% (E) unchanged ()
4. The simple interest on \$680 for 5 years is \$119. What is the rate of interest per annum?
(A) 3.5% (B) 7% (C) 14% (D) 42% (E) 49% ()
5. A dealer allows 30% discount on his list prices and then makes a profit of 25% on his cost price. What is the list price of a camera on which he gains \$91?
(A) \$76 (B) \$109.20 (C) \$148 (D) \$520 (E) \$650 ()
6. A mixture of coffee is made of grade A and grade B coffee powder in equal parts by weight. Grade A coffee costs \$20 per kg and grade B costs \$40 per kg. At what price per kg must the mixture be sold to make a profit of 10%?
(A) \$30 (B) \$31 (C) \$33 (D) \$36 (E) \$66 ()
7. The number of pupils in a school increases by 15% each year. If there are 1058 pupils this year, what was the enrolment for the year before last?
(A) 920 (B) 800 (C) 900 (D) 1000 (E) 1028 ()

8. The length and breadth of a cube are measured 10% too big and the height is measured 10% too small. What is the resulting percentage error in the volume?
(A) 30 more (B) 30 less (C) 10 more
(D) 8.9 more (E) 8.9 less ()
9. Each year a car depreciates by $22\frac{1}{2}\%$ of its value at the beginning of the year. What will be the value of a car at the end of two years if its value at the beginning of the first year is \$80 000?
(A) \$62 000 (B) \$48 050 (C) \$40 000
(D) \$18 000 (E) \$40 500 ()
10. A Filipino trader exported 7 908 692 pesos worth of goods to Singapore. If the exchange rate was S\$4.8702 to 100 pesos, estimate how much the importer in Singapore paid for the goods in S\$.
(A) 40 000 000 (B) 350 000 (C) 400 000
(D) 4 000 000 (E) 320 000 ()

Answers

- | | | | | |
|------|------|------|------|-------|
| 1. B | 2. C | 3. A | 4. A | 5. E |
| 6. C | 7. B | 8. D | 9. B | 10. C |

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks:



Secondary 1 Mathematics Test Chapter 11 Percentages

1. (a) Write $3\frac{3}{5}\%$ as a fraction reduced to its lowest terms. [1]
(b) Convert $1\frac{5}{8}$ to a percentage. [1]
2. An alloy of copper and tin contains 36% of copper by weight. Calculate the weight of copper which must be mixed with 96 kg of tin to produce a quantity of alloy. [3]
3. The list price of a car is \$98 800.
(a) If a discount of 12% is given for each payment, find the cash price of the car. [1]
(b) Jack chooses to buy by hire purchase over 12 months and is given a discount of 10%. Calculate his monthly instalment. [2]
4. A door-to-door salesman of electrical goods is employed with a guaranteed salary of \$960 per month. A bonus of 12% of sales is also paid if sales for the month exceed \$5000. Find the income received in a month when \$10 455 worth of goods is sold. [3]
5. Mr Lee received a salary of \$1800 in January this year. In February, his salary was increased by 8% and he was also given an additional allowance of \$20. Calculate the percentage increase in his earnings in February, giving your answer as a fraction. [3]
6. When a discount of $33\frac{1}{3}\%$ of the marked price of a radio is allowed, the radio is sold for \$54.
(a) How much discount does Raymond get when buying the radio? [2]
(b) How much must he pay for GST if 3% of GST is collected from him? [1]
7. A tourist from Thailand wishes to exchange Thai bahts for Singapore dollars. How many complete Thai bahts does he need to exchange for S\$80 if the exchange rate is 100 Thai bahts = S\$5.63? [3]

8. A businessman going to London on a weekend trip charged S\$2530 to sterling pounds at the rate of S\$2.20 to £1. How many sterling pounds did he get?
He spent £630, and changed the rest back to Singapore dollars at S\$2.15 to the £1.
How much Singapore currency did he get? [4]
9. A man has \$15 000 to invest. Which of the following will give him a greater annual return, and by how much?
- (a) Depositing the money in a bank which pays interest of $2\frac{3}{4}\%$ per annum, tax free.
(b) Buying shares costing \$5.00 each which pay a dividend of 12¢ per share, less 27% income tax. [4]
10. (a) A Singaporean holidaymaker in New York changed \$4260 into American dollars when the rate of exchange was US\$1=S\$1.42. How many American dollars did he receive? [2]
(b) A sales notice on a handbag reads “\$6 off marked price”. Express this discount as a percentage of the marked price of \$75. [2]
11. Miss Sim borrowed \$25 000 from the bank to renovate her house. At the end of one year she repaid \$12 375 inclusive of interest at $5\frac{1}{2}\%$ per annum on the loan. How much had she to pay at the end of the second year to clear the loan and interest due? [4]
12. A man borrows \$4800 from a moneylender who adds, as interest, $7\frac{1}{2}\%$ of the amount owing at the beginning of each year including the first. During the first year he pays back the loan by monthly instalments of \$180.
Calculate
(a) the amount still owing at the end of the first year, [2]
(b) each monthly instalment he must pay back in the second year to clear the debt. [3]
13. (a) Find the sum invested at $6\frac{1}{4}\%$ per annum if the simple interest for 9 months is \$30. [2]
(b) A fruitseller buys 480 kg of durian at \$2.50 per kg. He sells 20% of it at \$6 per kg and 75% of the remainder at \$4 per kg. If the rest of the durians are not sold, find the gain or loss as a percentage of the cost price. [3]
14. (a) A man borrows \$750 and pays off his debt at the end of 7 months by repaying \$785. Calculate the simple interest rate per annum charged on the loan. [2]
(b) Mr Lum sells a television set for \$918 and thereby makes a profit of 35% on his cost price. The manufacturer who sold the set to Mr Lum made a profit of 36% on his cost price. Find the cost of manufacture. [3]

15. In Mr Yong's shop, a pair of shoes for sale has a marked price of \$125. He allows a discount of 28% off the marked price, and still makes a profit of 25% of the price he paid for it. Find
- (a) the cost price to Mr Yong, [3]
 - (b) the percentage profit if the pair of shoes is sold at the marked price. [2]
16. In a certain town, the town council raises money by collecting from the owner of each house a yearly tax of $\frac{1}{3}\%$ of the value of that house.
- (a) Calculate the tax to be paid by the owner of a house valued at \$1 500 000. [1]
 - (b) The total value of all the houses in the town is \$240 000 000 000. Calculate the total sum to be collected by the council. [2]
 - (c) Of this total sum, 65% is to be spent on education. Calculate the amount to be spent on education. [2]
17. (a) Express 15 as a percentage of 80. [1]
- (b) In a sale, a fan is offered at 32% less than its normal selling price. Calculate the sale price of the fan which has a normal price of \$145. [2]
 - (c) Calculate the simple interest on \$1400 for 5 years 4 months at $10\frac{1}{2}\%$ per annum. [2]
18. P and Q are two fixed points 10 cm apart and R is a point on the line PQ such that PR is 6 cm. If the length of RQ is decreased by 9%, calculate the percentage increase in the length of PR. [4]
19. (a) A profit of 36% on the cost price was made by selling an article for \$40.80. Calculate the profit made. [2]
- (b) Calculate the simple interest on \$1424 invested for 15 months at $9\frac{1}{2}\%$ per annum. [2]
20. (a) An article can be bought from a shop by a single cash payment of \$720 or by 18 monthly instalments of \$56. Calculate the extra cost of paying by instalments and express this extra cost as a percentage of the cash payment. [3]
- (b) Calculate the simple interest on \$1152 for 10 months at $8\frac{3}{4}\%$ per annum. [2]

21. In January 1996, Mr Seah invested his savings of \$5000 in a building society at an interest rate of 8% per annum.
- (a) After 6 months, he withdrew all his money. How much did he receive? [2]
- (b) He then used 75% of his savings to book a holiday in Australia and set aside 85% of the remainder to convert to Australian dollars for the tour.
- (i) How much did he pay for booking the tour? [1]
- (ii) How many complete Australian dollars did he receive from converting the money set aside when the rate of exchange was A\$1=S\$1.13? [3]
22. (a) If $7\frac{1}{2}$ of $3x$ is 117, find x . [2]
- (b) John bought a calculator for \$18.50. He sold it to a customer at 22% profit. Find the selling price. [2]
- (c) A man bought a car for \$112 000 and sold it later for \$95 200. Find his percentage loss. [2]
23. (a) Express 54 g as a percentage of 64 g
- (i) exactly, [2]
- (ii) in decimal form, correct to 3 significant figures. [1]
- (b) If \$1840 amounts to \$2001 after 1 year and 8 months, find the rate of simple interest. [3]
24. A car rental company hires out cars at \$75 per day plus an insurance coverage of \$25 per car. If the total distance travelled during the total period of hire is 180 km or less, there is no extra charge. However, every extra kilometre travelled over 180 km is charged at 25¢ per extra kilometre.
- (a) A car was hired for 3 days and travelled 560 km in this time. Calculate the total hire charges. [2]
- (b) A man who hired a car for 4 days was charged \$415. Calculate the total distance he travelled. [2]
- (c) Another who hired a car for a number of days was charged a sum of \$185. If the total distance he travelled was 320 km, how many days did he hire the car? [2]
25. In January 1985, Mr Chong bought a car for \$102 000. For the whole of 1995, he travelled 16000 km at an average petrol consumption of 9.8 litres per 100 km. Petrol cost \$1.25 per litre, insurance cost \$420 for the year, road tax cost \$1450, servicing charges were \$60 and \$72 and he had to replace a battery at \$80. In January 1996, he sold the car for 92% of its cost price. Find the total cost of his motoring for the year and calculate, to the nearest cent, the cost per kilometre. [6]

26. (a) In a school of 1200 pupils, 46% of the pupils are girls. Given that one-sixth of the girls in the school are in Primary Six, find how many girls are in Primary Six. [2]
- (b) Two numbers are in the ratio 8 to 15. Express the smaller as a percentage of the larger, to the nearest whole number. [2]
- (c) During the past year Dylan's salary was increased by 12% and is now \$24 808 per annum. Calculate the annual salary he received a year ago. [2]
27. A man bought a house at \$1 250 000 and a car at \$220 000. A year later the value of the house had increased by 25%, but the value of the car had decreased by $12\frac{1}{2}\%$.
- (a) Calculate the total value of the house and the car now. [3]
- (b) Express the difference between the total value now and the total value a year ago as a percentage of the total value a year ago, giving your answer correct to one decimal place. [3]
28. (a) Find 19% of 1.8 kilometres, giving your answer in metres. [2]
- (b) The marked price of a watch is \$78.50.
- (i) In a sale, a discount of 8% is allowed on all articles. Calculate the sale price of the watch. [2]
- (ii) Given that the marked price of \$78.50 gave the shopkeeper 25% profit on his cost price, find the shopkeeper's cost price. [2]
29. The published price of a textbook is \$9.60. When ordered in bulk directly from the publisher, a discount of $17\frac{1}{2}\%$ is given on the published price, but the publisher charges for delivery. Mr Tan ordered 240 books for his students direct from the publisher and had to pay \$19.20 for the delivery of the books.
- (a) Calculate
- (i) the cost per book he ordered including the delivery charges, [3]
- (ii) the amount saved per book. [1]
- (b) Express the amount saved as a percentage of the published price. [1]
- (c) The total amount Mr Tan paid for the books. [2]
30. A car costing \$125 000 may be paid for in any of the following ways:
- Scheme A: By cash
- Scheme B: A deposit of 40% of the cost plus 72 monthly payments of \$1500.
- Scheme C: By bank loan over 5 years at 6% simple interest.
- (a) Calculate the cost by each method and find how much is saved between the least and most expensive schemes. [6]
- (b) Express the amount saved as a percentage of the cheapest scheme. [2]

31. (a) The simplest interest on \$1200 for 3 years is \$171. Calculate the rate per cent per annum. [2]
- (b) The income tax to be paid on a man's salary is calculated as follows:
 the first \$9600 is tax free,
 the next \$10 000 is taxed at 4%,
 the next \$5000 is taxed at 7%
 and the remainder of his salary is taxed at 12%.
- (i) Mr Koh's salary is \$46 000. Calculate the income tax paid by him. [3]
- (ii) Mr Chen pays \$4800 in tax. Calculate his salary. [4]
32. Mr Kwan bought 80 bicycles at \$120 each. He marked the price of each bicycle 50% above the cost price. To attract customers, he offered a discount of 15% off the marked price.
- (a) John bought a bicycle from Mr Kwan.
- (i) How much did John pay for the bicycle? [3]
- (ii) How much did John pay for the GST if 3% GST was collected from him? [1]
- (b) After selling 60 bicycles at the discounted price, Mr Kwan gave a further 10% off the discounted price to clear the remaining stocks. John's friend, Peter, bought one of the remaining 20 bicycles. How much did Peter pay for the bicycle excluding GST? [2]
- (c) Calculate Mr Kwan's total percentage profit from selling 80 bicycles. [3]
33. Simon sells two grades of coffee, grade A and grade B. He makes 10% profit on the cost price of grade A coffee and 15% profit on the cost price of the grade B coffee. The ratio of the cost prices of grade A coffee to grade B coffee is 3:2.
- (a) If the grade A coffee sells at \$33 per kg, find
- (i) the cost price per kg of the grade A coffee, [2]
- (ii) the cost price per kg of the grade B coffee, [1]
- (iii) the selling price per kg of the grade B coffee. [1]
- (b) He also mixes two grades of coffee. The mixture contains 44% of grade A coffee by weight.
- (i) Calculate the weight of grade B coffee which must be mixed with 84 kg of grade A coffee to produce a quantity of the mixture. [2]
- (ii) Find the cost price per kg of the mixture. [2]
- (iii) If the mixture sells at \$29.89 per kg, find the percentage profit he makes on the cost price of the mixture. [2]

34. In a local election in 1992 there were three candidates for one seat. Candidate A received 8740 votes, Candidate B 7380 votes and Candidate C 2880 votes.
- If 20 000 people could have voted, calculate the percentage of those who did not vote. [2]
 - Express the number of votes received by the elected candidate as a percentage of the total number of votes recorded. [1]
 - By 1997 the number of people who could have voted had increased by 10%. In the 1997 elections Candidate A and Candidate B were the only candidates, and only 90% of the people who could have voted actually did so. If Candidate A received $2\frac{1}{2}\%$ more of the total votes recorded than he did in 1992, find who was elected and by what majority of votes. [3]
35. After a company had paid tax on the profit it had made, \$36 000 000 remained.
- $25\frac{1}{2}\%$ of the sum was set aside for new investment.
- Calculate this amount set aside, correct to the nearest \$100 000. [3]
 - \$17 280 000 was paid as dividends to shareholders. Find what percentage this was of the \$36 000 000 available. [2]
 - Calculate the amount of tax paid, given that 28% of the profit was paid as tax. [3]
 - The shareholders paid 27% tax on the dividends they received. Find how much tax was collected from them. [2]
36. Find a man's taxable income if he paid \$1567.50 in tax when the income tax was levied at $12\frac{1}{2}\%$. [2]
37. (a) A man buys a book for \$12. His advertised selling price is 25% higher, but he gives a discount of 12% to schools. What is the selling price of the book to schools?
- (b) A salesman receives a basic salary of \$550 and commission of 4% of the value of goods sold in excess of \$4500. Find his income in a month when he sells goods worth \$18 000. [4]
38. (a) A man spends 10% of his monthly income on rent, 15% on food, 12% on clothes, 8% on income tax, 21% on other expenses and saves the rest. Given that he saves \$1292 a month, find his monthly income. [2]
- (b) The value of a car depreciates each year by 15% of its value at the beginning of the year. If a brand new car costs \$56 000, find its value at the end of 4 years correct to the nearest 100 dollars. [2]

39. A travelling salesman receives a basic salary of \$800 a month and a commission equal to 4% of the value of goods sold plus a car allowance of 60¢ per km.
- (a) Find his income for a particular month when he sells goods worth \$13 500 and travels 800 km.
 - (b) The next month, he travels 996 km and receives a total income of \$1970. Calculate the percentage increase in the value of goods sold. [4]
40. (a) Mr Chen is entitled to a tax-free allowance of \$16 000 and he pays tax at 12% on his income over that figure. Calculate how much he has to pay if his income is \$38 000.
- (b) Mr Lin is entitled to a tax-free allowance of \$13 000 and he pays tax at 14%. Find his income if he pays \$4060 in tax. [4]
41. A manufacturer knows that 6% of the light bulbs he makes are defective. Find the number of bulbs he must produce in order to obtain 611 light bulbs which are not defective.
- The manufacturing cost for the light bulbs is \$586.56. If he sells the non-defective light bulbs at a profit of 25%, find the selling price of each light bulb. [3]
42. A man buys a flat for \$100 000 and rents it out. He puts 14% of each month's rent aside for repairs and maintenance of the flat; pays \$272 in taxes per year and realises $8\frac{1}{2}\%$ on his investments. Calculate the monthly rent, correct to the nearest dollar. [3]

Answers

1. (a) $\frac{9}{250}$ (b) $162\frac{1}{2}\%$

2. 54 kg

3. (a) \$86 944 (b) \$7410

4. \$1614.60

5. $9\frac{1}{9}\%$

6. (a) \$27 (b) \$2.43

7. 1421

8. £1150, S\$1118

9. (a) gives him \$149.70 more

10. (a) US\$3000 (b) 8%

11. \$14 770

12. (a) \$3000 (b) \$268.75

13. (a) \$640 (b) 44% gain

14. (a) 8% (b) \$500

15. (a) \$72 (b) 73.6%

16. (a) \$5000 (b) \$800 000 000 (c) \$520 000 000

17. (a) $18\frac{3}{4}\%$ (b) \$ 98.60 (c) \$ 784

18. 6%

19. (a) \$10.80 (b) \$169.10

20. (a) \$288, 40% (b) \$84

21. (a) \$5200 (b)(i) \$3900 (ii) A\$977

22. (a) 520 (b) \$22.57 (c) 15%
23. (a) (i) $84\frac{3}{8}\%$ (ii) 84.4% (b) $5\frac{1}{4}\%$
24. (a) \$320 (b) 640km (c) 2 days
25. \$12 202, 76 cents
26. (a) 92 (b) 53% (c) \$22 150
27. (a) \$1755000 (b) 19.4%
28. (a) 342m (b) (i) \$72.22 (ii) \$62.80
29. (a) (i) \$8 (ii) \$1.60 (c) \$1 920
30. (a) Scheme A: \$125 000, Scheme B: \$158 000, Scheme C: \$162 500; \$37 500
(b) 30%
31. (a) $4\frac{3}{4}\%$ (b) (i) \$ 3318 (ii) \$ 58 350
32. (a) (i) \$153 (ii) \$4.59 (b) \$137.70 (c) 24.31%
33. (a) (i) \$30 (ii) \$20 (iii) \$23
(b) (i) 66kg (ii) \$24.40 (iii) 22.5%
34. (a) 5% (b) 46% (c) Candidate B by 594 votes
35. (a) \$9 200 000 (b) 48% (c) \$14 000 000 (d) \$4 665 600
36. \$12 540
37. (a) \$13.20 (b) \$1090
38. (a) \$3800 (b) \$29 200
39. (a) \$1820 (b) 6%
40. (a) \$2640 (b) \$42 000
41. 650 light bulbs, \$1.20
42. \$850

Chapter 12

Secondary 1 Mathematics

Chapter 12 Functions and Graphs

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (Pg 270)

- (a) 6 (b) 5, 4, 5, 4, 5, 4, 5
- (c) Swiss Mathematician Leonhard Euler (pronounced as “Leonard Oiler” 1707–1783) provided a very interesting solution in the form of a magic square solution.

Notice that each column and each row shown in the box on the right add up to 260.

Some students might be able to conclude that there is at least one other solution, i.e. the reflection of this table about the diagonal from corner 1. Have them figure this out as an exercise in motion geometry.

18	35	64	13	60	37	22	11
63	14	17	36	21	12	59	38
16	19	34	61	40	57	10	23
33	62	15	20	9	24	39	58
50	3	32	45	56	41	26	7
31	46	49	4	25	8	55	42
48	51	2	29	44	53	6	27
1	30	47	52	5	28	43	54

Secondary 1 Mathematics

Chapter 12 Functions and Graphs

GENERAL NOTES

As an introduction to the topic, the teacher may spend a little bit of time introducing and discussing the many situations that make use of the idea of co-ordinate geometry. Some of the examples not mentioned in the text are:

- (1) The latitude and longitude of a place on Earth, i.e. map work.
- (2) The seating layout in cinemas, stadiums, etc. with which most students should be familiar.
- (3) The display of flashcards during the National Day celebrations. Each card bearer is given a row and a column number for the co-ordinator to supervise.
- (4) Before a mural is painted on a wall, a picture is normally drawn on a piece of grid paper and then transferred to the wall.

Bring their attention also to the relationship between the graphs of $y = x + c$ and $y = x$ and in general to the relationship between the graphs of $y = mx + c$ and $y = mx$, i.e. the graph of $y = x + c$ is the translation of the graph of $y = x$, c units up or down parallel to the x -axis depending on whether $c > 0$ or $c < 0$ and the graph of $y = mx + c$ is the translation of the graph of $y = mx$, c units up or down parallel to the x -axis depending on whether $c > 0$ or $c < 0$. Thus, lead students to the conclusion that the graphs of $y = mx + c$ for various values of c are parallel and cut the y -axis at different points corresponding to different values of c .

Emphasise the fact that when two quantities are related in any way, it is often useful to show the relationship by means of a graph and the purpose of a graph is to convey information visually and quickly. Stress also that a good graph must be neat, clear and concise.

Choice of scale is important in this chapter. A scale will be determined by the *biggest* and *lowest* values of a given variable. The scale should be as large as possible as this allows space for more details. Plotting or graphing should be done carefully and neatly. The scale and names of the quantities (along the respective axes) should be clearly specified. Students must also be reminded of the following precautions when reading off figures from any graph:

- Check the scale
- Check the starting point of the respective axes
- Use a ruler

The Dynamic Mathematics Series on “**The Business of GRAPHS**” will provide extra drill and practice for the pupils if your school do have these CDs.

Go through the tutorials and activities.

Activity on Rectangular Co-ordinate System

1. Switch on the computer, put the CD-ROM into the CD-Drive, and close the Drive.
2. Click on Start, Programme, The Dynamic Mathematics Series and The Business of GRAPHS.
3. The program will begin with music and graphics of a detective entering a high-tech building. Please enjoy the sight and sound and wait for the main Menu to appear.
4. Click on Rectangular Cartesian System and it will begin with Cartesian Co-ordinates. Start with the Introduction, which will illustrate the use of co-ordinate system in everyday life situations. There are six examples in the introduction. Go through each of them and see how these are used. It will be followed by Rectangular Co-ordinates. There are 5 tutorials, T1 to T5. Go through each of them until you understand the concepts and able to answer the questions posed.
5. Click on the map. Select Activities on Naming Co-ordinates and go over A1 to A2. Click Next to continue Activities on Plotting Points and go over A1 to A3. Clicking on Next will bring you to Activities on Co-ordinate System and go over A1 to A2. Go over each of the tutorials and activities until you understand the concepts well. You can go over any part of the tutorial or activity by clicking on Map and proceed to the tutorial or activity that you need more explanation or practice.

Activity on Graphs of Linear Equations

1. Switch on the computer, put the CD-ROM into the CD-Drive, and close the Drive.
2. Click on Start, Programme, The Dynamic Mathematics Series and The Business of GRAPHS.
3. The program will begin with music and graphics of a detective entering a high-tech building. Please enjoy the sight and sound and wait for the main Menu to appear.
4. Click on Graphs of Linear Equations and it will begin with Basic Concepts; there are 2 tutorials, which will show you how to choose scales and what a graph is. Proceed to Drawing Linear Graphs where there are 5 tutorials. Proceed to Reading Linear Graphs where there is one tutorial. Go through each of them until you understand the concepts well. You can proceed to Activities on Drawing Linear Graphs by clicking on Next. There are 5 activities A1 to A5. Go through each of them until you understand the concepts and able to answer the questions posed. You can go over any part of the tutorial or activity by clicking on Map and proceed to the tutorial or activity that you need more explanation or practice.


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

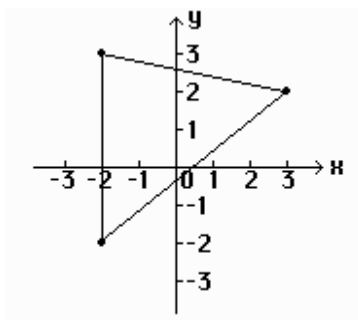
Class: _____

Time allowed: min

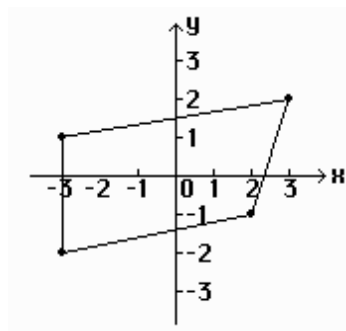
Marks: 

Secondary 1 Mathematics Test Chapter 12 Functions and Graphs

1. Plot the following points and join them in the order given: (0, 3), (3, 0), (-3, -1), (0, 3). Name the pattern formed. [2]
2. Plot the following points and join them in the order given: (-2, 4), (4, -2), (2, -4), (-4, 2), (-2, 4). Name the completed pattern. [3]
3. Plot the following points and join them in the order given: (-2, 3), (-1, 0), (0, -2), (1, 0), (2, -2), (4, 3). Name the completed pattern. [3]
4. Find the co-ordinates of the vertices of the figure. [2]



5. Find the co-ordinates of the vertices of the figure. [2]



6. Test the following points in order to find out which lie on the line $y = 3x + 2$.
 $A(1, 5), B(3, 12), C(0, 2), D(-2, 4), E(-\frac{1}{3}, 1)$ [2]

7. Test the following points in order to find out which lie on the line $y = -\frac{1}{2}x - 2$.
 $A(2, -1), B(-4, 0), C(\frac{2}{3}, -\frac{7}{3}), D(-\frac{1}{2}, -\frac{7}{4}), E(10, -3)$ [3]

8. (a) Given the equation $y = 2x + 5$, copy and complete the table below:

x	-1	0	1
y			

- (b) Draw the graph of the equation $y = 2x + 5$. [1]

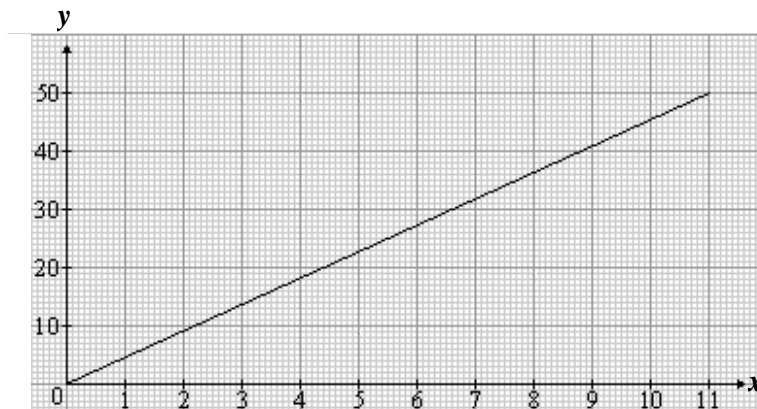
- (c) From your graph, find the value of x when $y = -\frac{13}{2}$. [2]

9. Draw the graph of each of the following linear functions:

- (a) x -axis (b) y -axis
(c) line $y = 2x$ (d) line $2y + x = 0$

10. Find the gradient of the line.

[2]



11. Using a scale of 2 cm to 1 unit on the x-axis and 1 cm to 1 unit on the y-axis, draw the graph of

$$y = \frac{3x+7}{2} \text{ for } -5 \leq x \leq 3.$$

[3]

12. Using a scale of 2 cm to 1 unit on the x-axis and 1 cm to 1 unit on the y-axis, draw the graph of

$$y = 12 - 3x \text{ for } -2 \leq x \leq 4.$$

[3]

13. Using a scale of 1 cm to 1 unit on the horizontal axis and 2 cm to 1 unit on the vertical axis, draw the graph of $4z = 8 - t$ for $-2 \leq t \leq 10$.

[3]

14. Plot each set of the given points on graph paper. Join the points in order with straight lines and identify the geometrical shapes obtained.

- | | |
|--|--|
| (a) (6, 4), (-6, 4), (-6, -4), (6, -4) | (b) (0, 5), (-6, 0), (0, -5), (6, 0) |
| (c) (0, 0), (0, 8), (5, 4) | (d) (1, 0), (0, 3), (-1, 4), (-5, -2) |
| (e) (4, 0), (0, 5), (-4, 0) | (f) (5, 2), (-1, 3), (-1, -3), (5, -2) |
| (g) (0, -3), (6, -3), (4, 2), (-1, 2) | |

[14]

15. Plot the following points on a piece of graph paper:

(3, -5), (2, -3), (1, -1), (0, 1), (-1, 3), (-2, 5), (-3, 7).

Do you notice that the points lie in a special pattern? Describe the pattern.

[3]

16. (a) Plot the following points on a piece of graph paper:

(-3, -1), (-2, 0), (-1, 1), (0, 2), (1, 3), (2, 4), (3, 5).

(b) Draw a line through all the points.

(c) What is the shape obtained?

[4]

17. Draw the graph of each of the following equations:

(a) $2y + x = 4$

(b) $2x + y = 3$

(c) $\frac{x}{2} + \frac{y}{3} = 1$

(d) $\frac{2y}{3} + \frac{x}{5} = 2$

[9]

18. Draw the graphs of each of the following pairs of equations and find the gradients of all the lines.

(a) $4y + 2x = 0$

(b) $2y = x + 2$

$2y + 6x = 10$

$5x - 2y = 10$

(c) $7x + y = 12$

(d) $\frac{1}{2}x + \frac{1}{2}y = 1$

$5y + 6x = 2$

$\frac{1}{5}x - \frac{1}{2}y = 1\frac{1}{10}$

[16]

Answers

1. Triangle
2. Rectangle
3. The letter *W*
4. $(-2, 3), (-2, -2), (3, 2)$
5. $(-3, -2), (2, 1), (3, 2), (-3, 1)$
6. *A, C and E.*
7. *B, C and D.*
8. (a) 3, 5, 7
(b) $-5\frac{3}{4}$
10. $4\frac{6}{11}$
14. (a) rectangle (b) rhombus (c) isosceles triangle
(d) quadrilateral (e) isosceles triangle (f) trapezium
(g) trapezium
15. The points lie on a straight line.
16. (c) A straight line.
18. (a) $-\frac{1}{2}, -3$ (b) $\frac{1}{2}, 2\frac{1}{2}$
(c) $-7, -1\frac{1}{5}$ (d) $-1, \frac{2}{5}$

Chapter 13

Secondary 1 Mathematics

Chapter 13 Statistics

GENERAL NOTES

The elementary part of reading statistical graphs has already been broached at primary level. Therefore, the first part of this chapter should not present any problems to most students.

Statistics can be quite a dry topic if students are given a direct approach. Teachers can assign mini-projects for groups of students, asking them to do simple surveys on topics like:

- (1) the size of their feet,
- (2) the number of hours they spend watching TV,
- (3) the number of hours they spend doing their homework,
- (4) the number of SMS they send out every month,
- (5) the number of MMS they send out every month,
- (6) the amount of their monthly mobile phone bill,
- (7) their favourite TCS artistes/programmes,
- (8) their favourite actors/actresses.

Teachers may want some newspaper cuttings of statistics compiled by the department of statistics published occasionally by the Straits Times or Lianhe Zaobao.

To arouse lively participation, teachers may wish to mention a survey done in the late seventies by the "New Nation" (now defunct) which had a lead story that read "Singapore girls prefer men on the plump side." It will most likely create plenty of laughter and heated disagreements from both the boys and the girls in the classrooms. The reasons given then by the girls who participated in the survey were:

- men on the plump side signify prosperity, and
- plump men are normally good-natured and more jovial.

With this introduction, teachers can easily introduce the notion of averages and analyse the way statistics may be distorted to one's subjective liking by using any one of the averages.

This topic provides many opportunities for teachers to get their students to obtain some social facts about our society. Students may be asked to compare the living conditions in Singapore with neighbouring countries or other western societies.

Students may be interested to know how the term "the 7-year-itch" came about. Seven years was the median duration of marriages that ended in divorce in the fifties in America. What is the median age of divorce in Singapore?

At the end of the lesson, ask pupils to list the advantages and disadvantages of using certain pictograph, pie chart, bar chart, line graph or histogram. Do encourage the pupils to take part in the statistical chart presentation competition organised by the Singapore Mathematical Society.

Example 2 from page 321 is one common strategy played up by merchants and

developers or brokers to attract people to buy their products. They are deceiving in that the first impression given is that their products or services are much superior as compared with their competitors. Ask pupils to look out for similar advertisements appearing in the local newspaper. Encourage them to bring these newspaper cuttings to class to share with their classmates.

NE MESSAGES

Page 291 Introduction to Numerical Data No. (3)

Page 307 on Government Recurrent Expenditure on University Education

Ask pupils if they like the educational system in Singapore. Get them to find out about educational systems in other countries and compare them with ours. We may not be the best but we certainly are the top in this region.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Time allowed: 35 min

Class: _____

Marks:



Secondary 1 Multiple-Choice Questions Chapter 13 Statistics

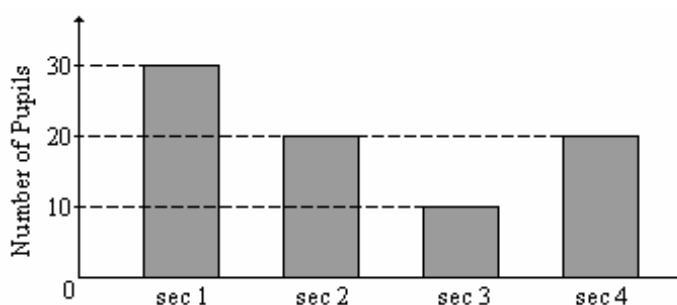
1. A pie chart is drawn to represent the language spoken by 72 workers of whom 22 speak Malay only, 32 speak Chinese only and 18 speak neither. Find the angle, in degrees, of the sector representing those speaking neither languages.

(A) 30° (B) 60° (C) 90° (D) 120° (E) 150°

()

2. If the information shown in the bar chart is represented on a pie chart, the angle of the smallest sector is

(A) $22\frac{1}{2}^\circ$
(B) 45°
(C) 60°
(D) 90°
(E) 108°

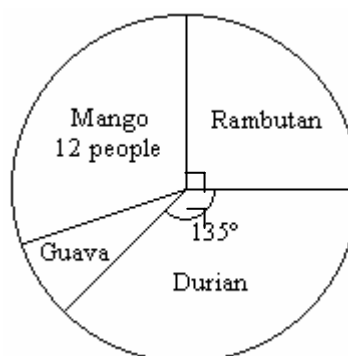


()

Questions 3 and 4 refer to the pie chart which shows the favourite fruit of a group of 40 people.

3. How many of the people like durian?

(A) 25 (B) 20
(C) 15 (D) 10
(E) 5



()

4. The ratio of the people who like mango to those who like guava is

(A) 10:1 (B) 4:1
(C) 1:4 (D) 10:3
(E) 3:10

()

5. During a season, the goals scored by a soccer team in 15 matches were as follows:

Goals scored in a match	0	1	2	3	4
Frequency	1	6	3	2	3

The most common number of goals scored was

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4 ()

Answers

1. C 2. B 3. C 4. B 5. B

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks:

/

Secondary 1 Mathematics Test Chapter 13 Statistics

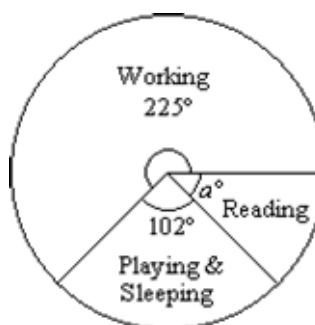
1. The pie chart shows how Zili spends the 24 hours in a day.

Calculate (a) the angle of the sector labelled a ,

[1]

(b) the number of hours Zili works each day.

[2]



2. The pie chart shows the number of students and teachers of a certain college.

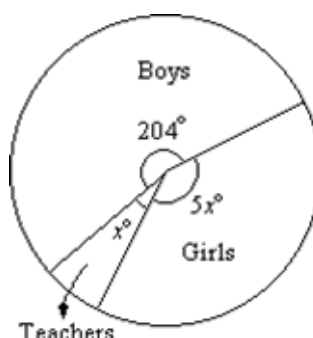
(a) Calculate the value of x .

[1]

(b) If there are 91 teachers in the school, how many

(i) boys, (ii) girls,
are there in the school?

[4]



3. Each student in a group of 144 was asked to choose a book or a CD player or a set of computer games as a present. Their choices are presented on the pie chart. Calculate
- the value of x , [1]
 - the fraction of the group that chose a calculator, [1]
 - the number of students who chose a set of computer games. [1]



4. The pie chart illustrates the sales of various brands of petrol in a certain city.
- What percentage of the sales does "SHELL" have? [1]
 - Given that Caltex accounts for 22.5% of the total sales, calculate the values of x and y . [2]



5. The table below shows the frequency distribution of the number of grammatical mistakes made by each student in a class of 40.

Number of mistakes	0	1	2	3	4	5	6
Number of students	4	8	12	4	6	4	2

- Draw a histogram to represent the frequency distribution. [2]
- What is the most common number of mistakes made by the students? [1]
- Find the percentage of students who make more than 3 mistakes. [2]

6. The temperatures in degree Celsius ($^{\circ}\text{C}$) each day over an eight-week period were as follows:

32, 28, 30, 32, 31, 29, 31, 27, 28, 30, 31, 31, 32, 31,
 33, 30, 29, 27, 31, 31, 32, 30, 31, 31, 30, 32, 32, 32,
 30, 29, 28, 28, 29, 27, 30, 32, 32, 31, 28, 32, 33, 32,
 33, 30, 28, 27, 28, 29, 27, 29, 28, 30, 31, 32, 33, 32

- (a) Construct a frequency table for the data set [2]
 (b) What is the most common temperature? [1]
 (c) Find the fraction of days in which the temperatures are 30°C or lower. [2]

7. A group of American students were asked to state their political party affiliations such as Democratic, Republican or Others. The overall response is given in the table below:

Party	Democratic	Republican	Others
Frequency	13	18	9

Draw a pie chart to represent the distribution. [4]

8. The table below shows the overall response of children to the removal of their toys.

Response of child	Cry	Express Anger	Silence	Play With Another Toy
Number of children	100	60	20	20

Represent the data above using a pie chart. [3]

9. To study their attitudes towards community issues, 200 people were asked whether they were spending “too little”, “just right”, or “too much” on community service programmes.

The result are shown in the following table:

Attitude	Too little	Just right	Too much
Number of people	65	90	45

Represent the results using a pie chart. [4]

10. The following table shows the marital status of a group of males.

Marital status	Single	Married	Widowed	Divorced
Frequency	25	70	15	10

Represent the information using a pie chart.

[4]

11. Five coins were tossed 1000 times, and at each toss the number of heads was recorded. The results were obtained as shown in the table below:

Number of heads	0	1	2	3	4	5
Number of tosses	38	144	342	287	164	25

(a) Draw a histogram to represent the results.

[3]

(b) Calculate the percentage of tosses in which four or more tails were obtained.

[2]

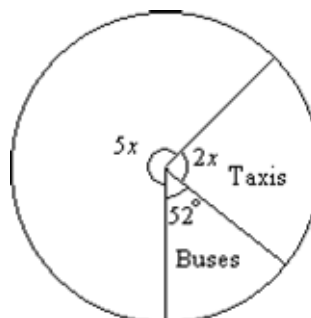
12. In a survey, the number of cars, taxis and buses arriving at a traffic junction were noted and the results represented by the given pie chart.

(a) Calculate the values of x .

[2]

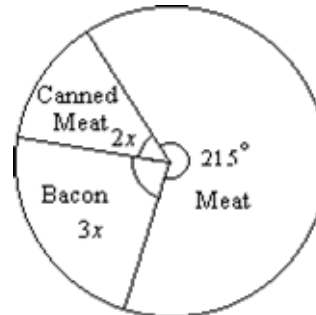
(b) If the number of taxis was 66, calculate the total number of vehicles included in the survey.

[2]



13. The pie chart below shows the import of food into a country in 1996.

- (a) Calculate the value of x . [2]
 (b) If the quantity of canned meat imported was 87 thousand tonnes, find the total quantity of foods imported in 1996. [2]

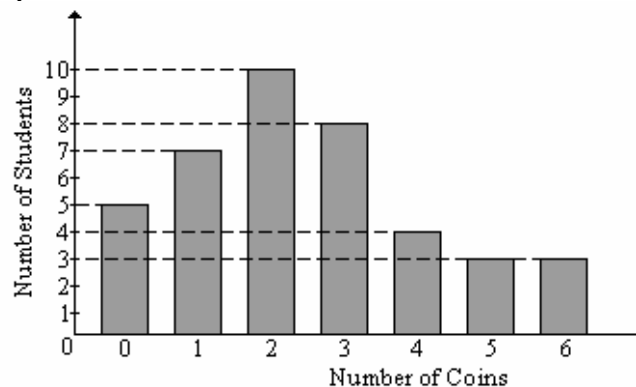


14. The following table gives the production of steel in 5 districts of a certain country in 1996.

District	A	B	C	D	E
Ten thousand tonnes	80	135	240	185	360

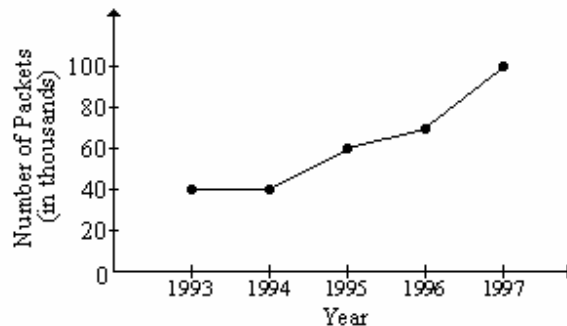
- Construct a (a) bar chart [3]
 (b) pie chart [4]
 to illustrate the data.

15. Each student from a Secondary Two class was asked individually how many coins they had in their pockets. The bar chart below illustrates the results of this survey.



- (a) Find
 (i) the number of students in the class, (ii) the modal number of coins,
 (iii) the median number of coins, (iv) the mean number of coins,
 (v) the percentage of students having 4 or more coins. [5]
 (b) Display the results of the survey using a pie chart with 5 sectors, one of which represents students having 4 or more coins. [3]

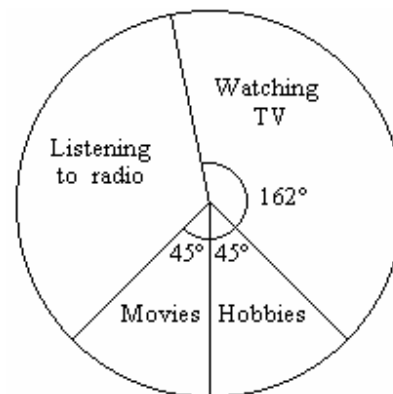
16. The line graph shows the sale of packets of a certain brand of soap powder in a mini-market from 1993 to 1997.



- When did the sale first exceed the 50 000 mark?
- In what year was the sale exactly 100 000?
- Find the percentage increase in sales from 1995 to 1997.

[5]

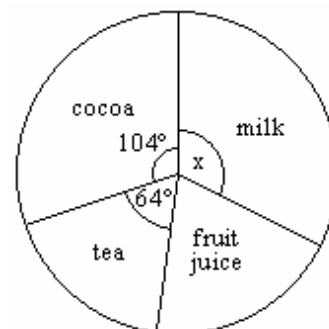
17. A survey was carried out in a firm to find out what the employees usually do in the evenings. The information is represented in the given pie chart.



- Find the percentage of employees who spend their time watching TV.
- Given that 24 employees spend their time listening to the radio, calculate the total number of employees involved in the survey.

[4]

18. Each member of a class of 45 Primary Three pupils was asked to name his or her favourite drink. Their choices are represented in the given pie chart.



- If 15 said they liked milk, calculate the value of x .
- Find the number who said they liked tea.
- Find the percentage of the class who said they liked cocoa.

[5]

19. The number of eggs laid each day by 10 hens over a period of 21 days were:

8, 9, 10, 8, 5, 10, 8, 10, 8, 7, 8,
6, 9, 8, 10, 9, 7, 9, 8, 9, 7

- Construct a frequency table for the number of eggs laid.
- Draw a histogram to illustrate the results.
- What is the most common number of eggs laid each day?

[6]

20. The table below shows the number of microcomputers a shop sold per day during a period of 30 days.

<i>No. of microcomputers sold</i>	0	1	2	3	4	5	6
<i>No. of days</i>	2	3	6	9	4	4	2

- (a) Draw a histogram to illustrate the results.
(b) What is the most common number of microcomputers sold per day? [5]
21. A bag contained five balls with each bearing one of the numbers 1, 2, 3, 4 and 5. A ball was drawn from the bag, its number noted, and then replaced. This was repeated 60 times and the table below shows the resulting frequency distribution.

<i>Number</i>	1	2	3	4	5
<i>Frequency</i>	17	13	9	10	11

- (a) Draw a histogram to illustrate the results
(b) Which number was drawn most often? [5]

Answers

1. (a) 33° (b) 15 hours
2. (a) 26° (b) (i) 714 (ii) 455
3. (a) 30 (b) $\frac{1}{3}$ (c) 84
4. (a) $26\frac{2}{3}\%$ (b) $x = 81, y = 40$
5. (b) 2 (c) 30%
6. (c) 32°C (d) $\frac{1}{2}$
- 11 (b) 18.2%
12. (a) 44° (b) 270
13. (a) 29° (b) 240 thousand tonnes
15. (a) (i) 40 (ii) 2 (iii) 2 (iv) 2.5 (v) 25%
16. (a) 1995 (b) 1997 (c) $66\frac{2}{3}\%$
17. (a) 45% (b) 80
18. (a) 120 (b) 8 (c) $28\frac{8}{9}$
19. (c) 8
20. (b) 3
21. (b) 1

Chapter 14

Secondary 1 Mathematics
Chapter 14 Basic Geometrical Concepts and Properties

ANSWERS FOR ENRICHMENT ACTIVITIES

Exploration (pg 335)

There are $1 + 2 + 3 + 4 + 5$ different angles, i.e. 15 different angles.

Just For Fun (pg 343)

All the lines x, y are parallel. This is due to optical illusion.

Secondary 1 Mathematics

Chapter 14 Basic Geometrical Concepts and Properties

GENERAL NOTES

This chapter deals with the classical Euclidean Geometry and students are introduced to simple proofs. Geometry is an objective and non-controversial topic. The students may like to know that through learning geometry, they can develop the ability to draw accurate plans required in engineering, the construction industry, landscape architecture, interior design and decoration and many other areas.

Some students find it difficult to identify pairs of alternate angles, corresponding angles and interior angles. It is therefore useful to provide them with ample practice on the identification of these angles. As a class activity, you may get your students to construct different figures with their compasses and set-squares. Get them to identify the different types of angles in their drawings. The activity using GSP to prove the geometrical properties are useful and enriching for the pupils (page 345 – 346).

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

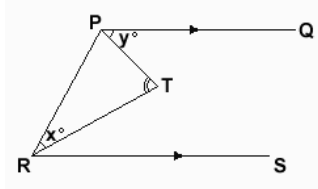
Time allowed: 35 min

Marks:

8

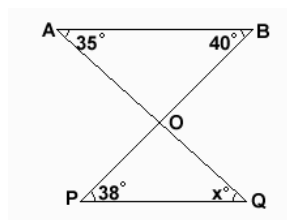
Secondary 1 Multiple-Choice Questions Chapter 14 Basic Geometrical Concepts and Properties

1. In the figure, PQ is parallel to RS , PT is the bisector of $\angle RPQ$ and RT is the bisector of $\angle RPS$. If $\angle RPT = x^\circ$ and $\angle TPQ = y^\circ$, what is the size of $\angle PTR$?



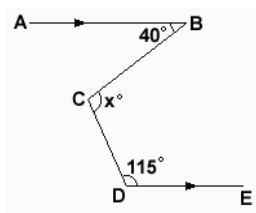
- (I) 90° (II) $x^\circ + y^\circ$ (III) $180^\circ - x^\circ - y^\circ$
(A) I only (B) I and II only (C) I and III only
(D) II and III only (E) I, II and III ()

2. In the figure, AOQ and POB are straight lines. $\hat{A} = 35^\circ$, $\hat{B} = 40^\circ$, $\hat{P} = 38^\circ$ and $\hat{Q} = x^\circ$. Find the value of x .



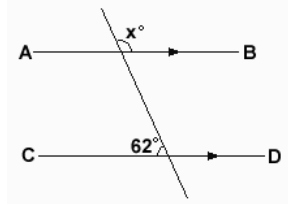
- (A) 21 (B) 37 (C) 43 (D) 49 (E) 67 ()

3. In the figure, $AB \parallel DE$, $\angle ABC = 40^\circ$, $\angle BCD = x^\circ$ and $\angle CDE = 115^\circ$. What is the value of x ?



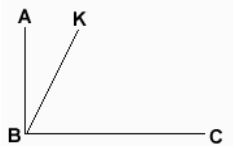
- (A) 105 (B) 115 (C) 125 (D) 130 (E) 145 ()

4. In the diagram, AB is parallel to CD . The value of x is _____.



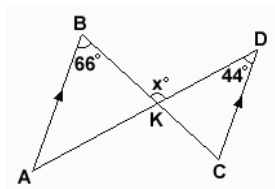
- (A) 138 (B) 124 (C) 118 (D) 108 (E) 62 ()

5. In the diagram, $\angle ABK$ and $\angle CBK$ are complementary. Given that $\angle CBK$ is 50° greater than $\angle ABK$, the value of $\angle ABK$ in degrees is _____.



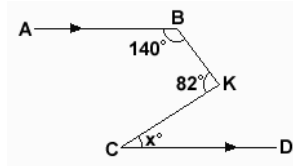
- (A) 20 (B) 40 (C) 45 (D) 50 (E) 60 ()

6. In the figure, $AB \parallel CD$, $\angle BDK = x^\circ$, $\angle ABK = 66^\circ$ and $\angle CDK = 44^\circ$. The value of x is _____.



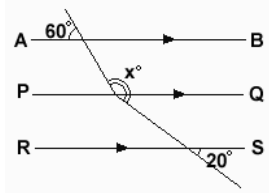
- (A) 44 (B) 55 (C) 66 (D) 70 (E) 110 ()

7. In the figure, $AB \parallel CD$, $\angle ABK = 140^\circ$, $\angle BKC = 82^\circ$ and $\angle KCD = x$. The value of x is _____.



- (A) 4 (B) 42 (C) 48 (D) 62 (E) 82 ()

8. The three straight lines AB , PQ and RS are parallel. Find the value of x .



- (A) 120 (B) 130 (C) 140 (D) 150 (E) 160 ()

Answers

1. E	2. B	3. A	4. C	5. A
6. E	7. B	8. C		

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

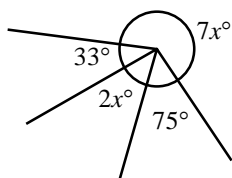
Class: _____

Time allowed: _____ min

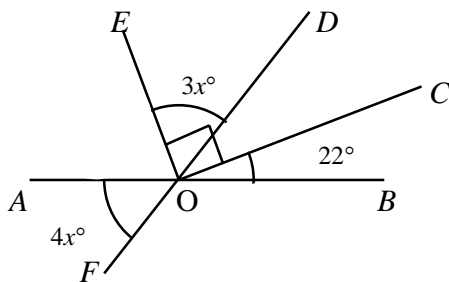
Marks: 

Secondary 1 Mathematics Test Chapter 14 Basic Geometrical Concepts and Properties

1. (a) What is the complement of the angle 52° ? [1]
(b) What is the supplement of the angle 65° ? [1]
2. Form an equation in x and find x . [2]



3. Given that AOB and FOD are straight lines and $\angle EOC = 90^\circ$, $\angle BOC = 22^\circ$, $\angle EOD = 3x^\circ$ and $\angle AOF = 4x^\circ$, find
 - (a) x , [3]
 - (b) $\angle COD$, [1]
 - (c) $\angle AOE$. [1]



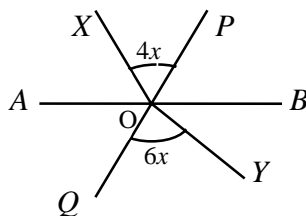
4. In the diagram AOB and POQ are straight lines. $\angle AOX = 42^\circ$, $\angle BOY = 24^\circ$, $\angle POX = 4x^\circ$ and $\angle QOY = 6x^\circ$. Find

(a) x ,

[2]

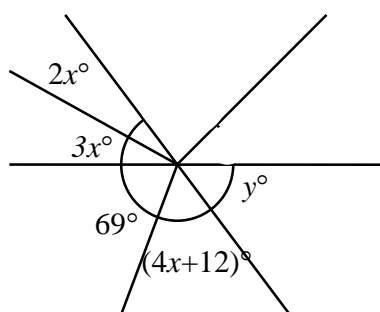
(b) $\angle POB$.

[2]



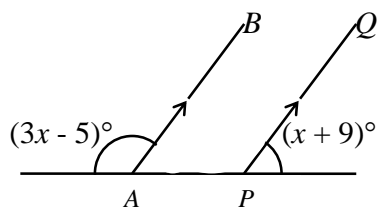
5. Find the values of x and y in the diagram.

[4]



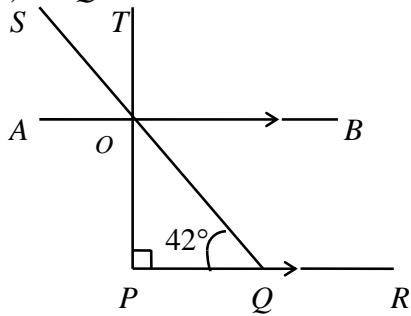
6. In the figure, $AB \parallel PQ$. Find the value of x .

[2]

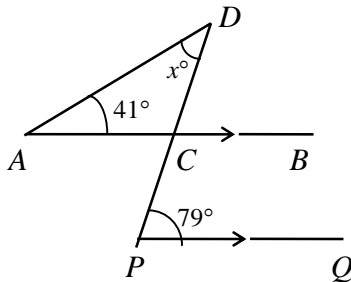


7. In the figure, POT , AOB , PQR and SOQ are straight lines. Given that $AOB \parallel PQR$, $\angle OPQ = 90^\circ$ and $\angle PQS = 42^\circ$, calculate

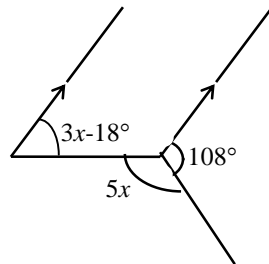
- (a) $\angle AOS$, [2]
 (b) $\angle SOT$, [1]
 (c) $\angle OQR$. [1]



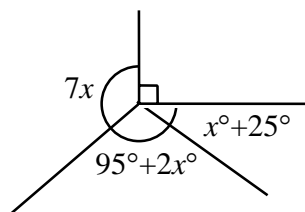
8. Given that $ACB \parallel PQ$, find the value of x . [2]



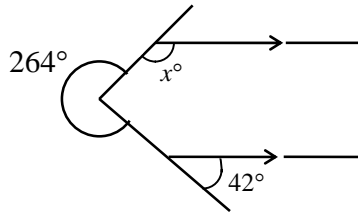
9. Find the value of x in the figure. [3]



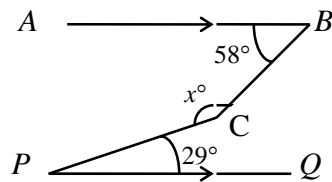
10. Find x in the given figure. [2]



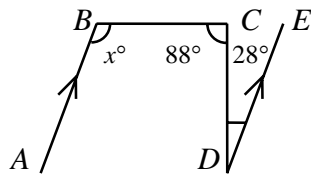
11. Find the value of x in the given figure. [3]



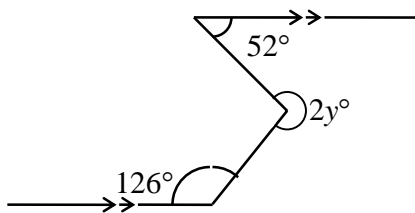
12. Given that $AB \parallel PQ$, find the value of x . [3]



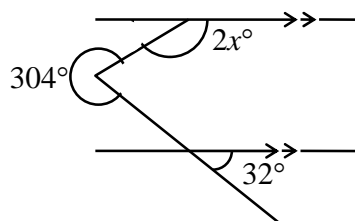
13. Given that $AB \parallel DE$, $\angle BCD = 88^\circ$ and $\angle CDE = 28^\circ$, $\angle ABC = x^\circ$, find x . [3]



14. Find the value of y in the given figure. [3]

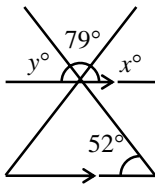


15. Find the value of x in the given figure. [3]



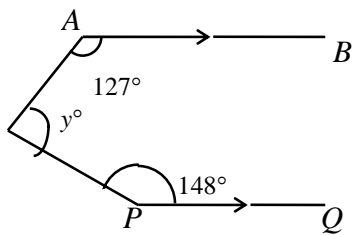
16. Find the values of x and y in the given figure.

[3]



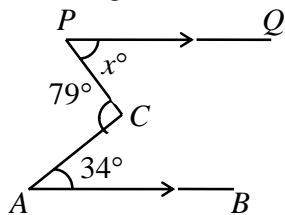
17. In the figure, $AB \parallel PQ$. Find the value of y .

[3]



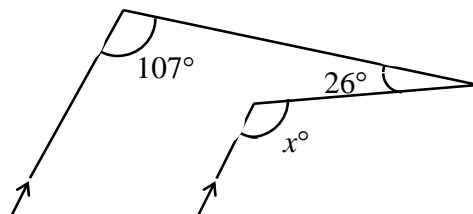
18. In the figure, $PQ \parallel AB$. Find the value of x .

[2]



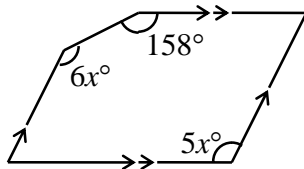
19. Form an equation in x and solve for x .

[3]

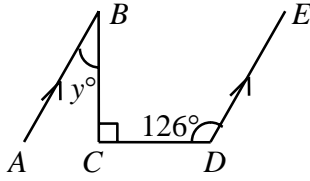


20. Form an equation in x and solve for x .

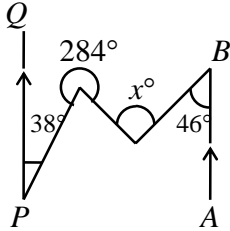
[3]



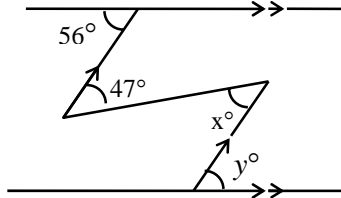
21. In the figure, $AB \parallel DE$. Find the value of y . [3]



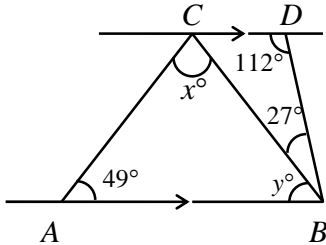
22. In the diagram, $PQ \parallel AB$. Find the value of x . [3]



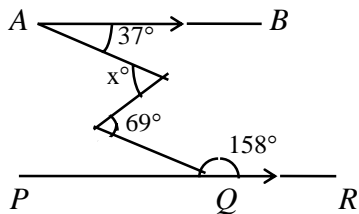
23. Find the values of x and y in the diagram. [3]



24. Find the values of x and y . [4]

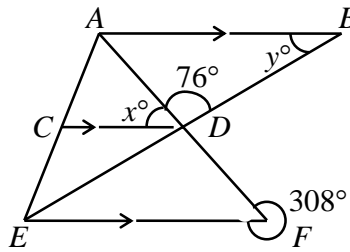


25. In the figure, $AB \parallel PQR$. Find the value of x . [3]



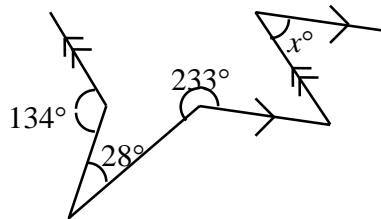
26. Find the values of x and y in the given figure.

[4]



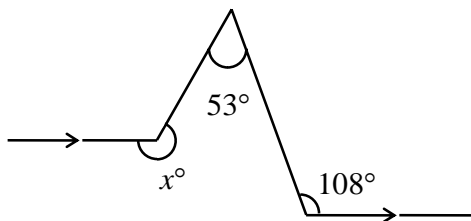
27. Find the value of x in the given figure.

[4]



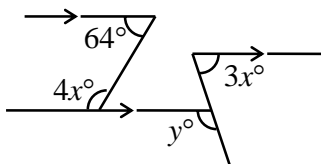
28. Find the value of x in the given figure.

[3]

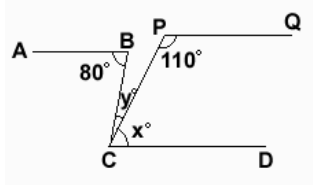


29. Find the values of x and y .

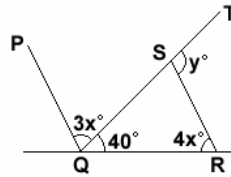
[4]



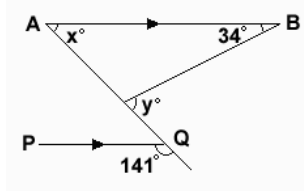
30. In the figure, $AB \parallel PQ \parallel CD$, $\hat{A}BC = 80^\circ$, $\hat{BC}P = y^\circ$, $\hat{PC}D = x^\circ$ and $\hat{C}PQ = 110^\circ$. Find the values of x and y . [4]



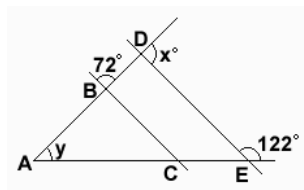
31. In the figure, $PQ \parallel SR$, $\hat{P}QS = 3x^\circ$, $\hat{S}QR = 40^\circ$, $\hat{Q}RS = 4x^\circ$ and $\hat{R}ST = y^\circ$. Find the values of x and y . [4]



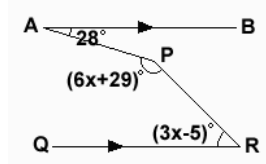
32. Find the values of x and y given that AB is parallel to PQ . [4]



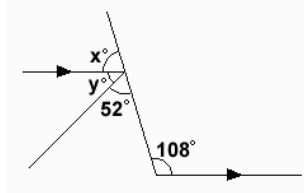
33. In the figure, $BC \parallel DE$. Find the values of x and y . [4]



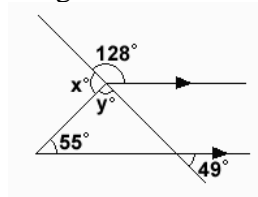
34. In the figure, $AB \parallel QR$. Find the value of x . [3]



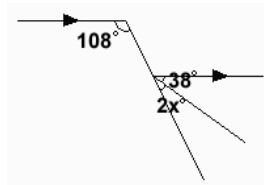
35. Find the values of x and y in the figure. [4]



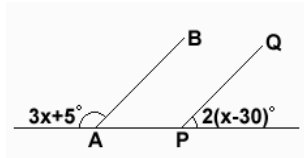
36. Find the values of x and y in the figure. [4]



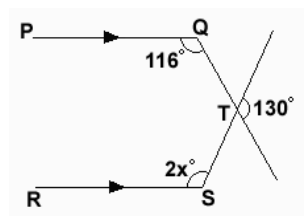
37. In the given figure, find the value of x . [3]



38. In the diagram, $AB \parallel PQ$. Find the value of x . [2]



39. In the given figure, $PQ \parallel RS$. Find the value of x . [3]



Answers

1. (a) 38° (b) 135°
2. 28
3. (a) 16° (b) 42° (c) 68°
4. (a) 9 (b) 102°
5. $x = 11, y = 55$
6. 44
7. (a) 42° (b) 48° (c) 138°
8. 38
9. 27
10. 15
11. 126
12. 151
13. 120
14. 127
15. 78
16. $x = 49, y = 52$
17. 85
18. 45
19. 133
20. 32
21. 36
22. 84

23. $x = 47, y = 56$

24. $x = 90, y = 41$

25. 84

26. $x = 52, y = 52$

27. 53

28. 235

29. $x = 29, y = 93$

30. $x = 70, y = 10$

31. $x = 20, y = 120$

32. $x = 39, y = 73$

33. $x = 108, y = 50$

34. $x = 20\frac{4}{9}$

35. $x = 72, y = 56$

36. $x = 107, y = 76$

37. $x = 17$

38. $x = 47$

39. $x = 57$

Chapter 15

Secondary 1 Mathematics
Chapter 15 Angle Properties Of Polygons

ANSWERS FOR ENRICHMENT ACTIVITIES

Just For Fun (pg 370)

There are 5 quadrilaterals, 1 pentagon and 8 triangles.

Secondary 1 Mathematics

Chapter 15 Angle Properties Of Polygons

GENERAL NOTES

The pupils had learnt about the properties of triangles in their primary school days and had also learnt of the proofs that the sum of the angles of a triangle is 180° . You can use the Geometer's Sketchpad (GSP) to show that the sum of the angles of a triangle is 180° and that the exterior angle is equal to the sum of the interior opposite angles. The GSP is also a good medium to show the various properties of quadrilaterals.

The sub-topic of angle properties of polygons is brought from Sec 2 to Sec 1 and it is an interesting topic to have for the Sec 1 pupils.

XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

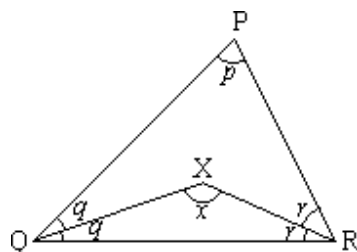
Time allowed: 35 min

Marks:

6

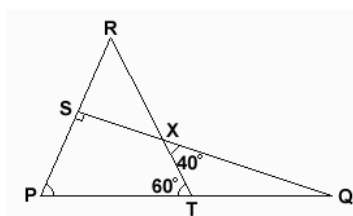
Secondary 1 Multiple-Choice Questions Chapter 15 Angle Properties Of Polygons

1. In the figure, QX and RX are the angle bisectors of $P\hat{Q}R$ and $P\hat{R}Q$ respectively. Express x in terms of p , q or r .



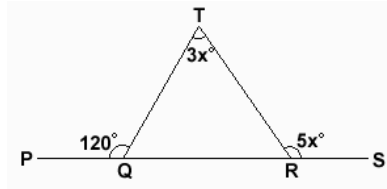
- (A) $2p$ (B) $2(q + r)$ (C) $p + q + r$
(D) $p - q - r$ (E) $p + 2q - 2r$ ()

2. In the figure, QS is perpendicular to PR , $T\hat{X}Q = 40^\circ$ and $P\hat{T}R = 60^\circ$. Calculate $R\hat{P}T$.



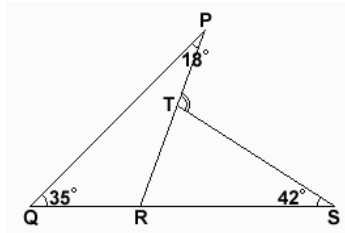
- (A) 50° (B) 60° (C) 70° (D) 75° (E) 80° ()

3. In the figure, $PQRS$ is a straight line; $\hat{Q}TR = 3x^\circ$, $\hat{T}RS = 5x^\circ$ and $\hat{P}QT = 120^\circ$. Find x .



- (A) 15 (B) 20 (C) 25 (D) 30 (E) 40 ()

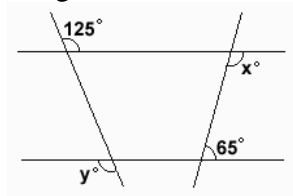
4. In the figure, QRS is a straight line. $\hat{P}QR = 35^\circ$, $\hat{Q}PR = 18^\circ$ and $\hat{Q}ST = 42^\circ$. Calculate \hat{PTS} .



- (A) 77° (B) 85° (C) 95° (D) 105° (E) 119° ()

5. The interior angles of a quadrilateral are in the ratio 1 : 2 : 3 : 4. The smallest interior angle is _____.
 (A) 20° (B) 36° (C) 72° (D) 108° (E) 144° ()

6. With the notations shown in the figure, calculate the value of $x + y$.



- (A) 125° (B) 170° (C) 190°
 (D) 230° (E) cannot be found ()

Answers

- | | | | | |
|------|------|------|------|------|
| 1. C | 2. C | 3. D | 4. C | 5. B |
| 6. E | | | | |


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

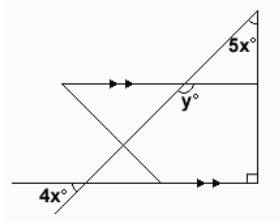
Time allowed: min

Marks: 

Secondary 1 Mathematics Test Chapter 15 Angle Properties Of Polygons

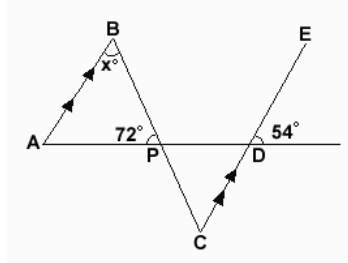
1. Find the values of x and y in the given figure.

[4]



2. Find the value of x in the given figure where $AB \parallel CE$.

[3]



3. $PQRS$ is a rhombus in which $\angle PQR = 108^\circ$. Find the size of

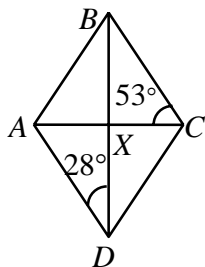
(a) $\angle PRQ$,

[2]

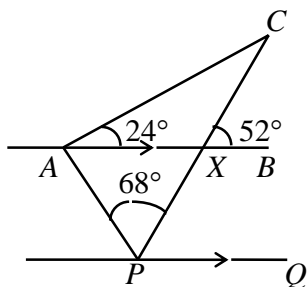
(b) $\angle PSQ$.

[1]

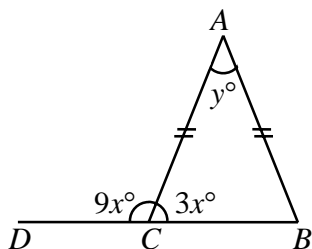
4. In the diagram $ABCD$ is a kite in which $\angle BCA = 53^\circ$ and $\angle ADB = 28^\circ$. Find the size of
- (a) $\angle ABX$, [2]
 (b) $\angle BAD$. [2]



5. In the figure $AB \parallel PQ$, $\angle APX = 68^\circ$, $\angle CXB = 52^\circ$ and $\angle XAC = 24^\circ$, calculate
- (a) $\angle XPQ$ [1]
 (b) $\angle ACX$ [1]
 (c) $\angle PAB$ [1]



6. If an exterior angle of an octagon is 73° while the other seven exterior angles are each equal to x° , calculate the value of x . [2]
7. Given that $AB = AC$, $\angle ACD = 9x^\circ$, $\angle ACB = 3x^\circ$ and $\angle BAC = y^\circ$, calculate
- (a) x , [1]
 (b) y . [2]



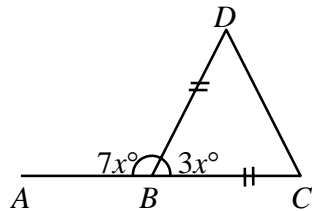
8. Given that $\angle ABD = 7x^\circ$, $\angle DBC = 3x^\circ$ and $BD = BC$, calculate

(a) x ,

[1]

(b) $\angle BCD$.

[2]



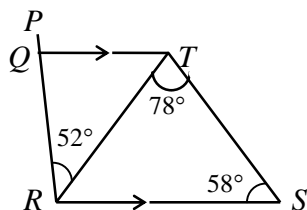
9. In the diagram $QT \parallel RS$, $\angle QRT = 52^\circ$, $\angle RST = 58^\circ$ and $\angle RTS = 78^\circ$. Calculate

(a) $\angle TRS$,

[1]

(b) $\angle PQT$.

[2]



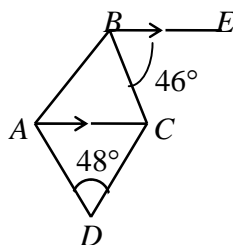
10. In the figure $ABCD$ is a kite. $AC \parallel BE$, $\angle CBE = 46^\circ$ and $\angle ADC = 48^\circ$. Calculate

(a) $\angle ABC$,

[2]

(b) $\angle BAD$.

[2]



11. In $\triangle ABC$, $\angle ABC = 55^\circ$, AC is produced to D such that $\angle BCD = 110^\circ$. Calculate

(a) $\angle ACB$,

(b) $\angle BAC$.

What is the special name for $\triangle ABC$?

[4]

12. In $\triangle ABC$, $\angle A = a^\circ$, $\angle B = b^\circ$ and $\angle C = c^\circ$. If $a : b = 4 : 6$ and $b : c = 3 : 5$, find the value of a .

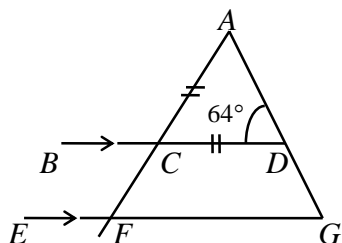
[3]

13. In $\triangle ABC$, $\angle ABC = 48^\circ$ and $\angle BAC = 70^\circ$. The angle bisector of $\angle ACB$ meets AB at D . Calculate $\angle BDC$.

[3]

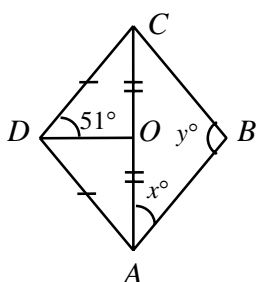
14. Given that $BCD \parallel EFG$, $CD = AC$ and $\angle ADC = 64^\circ$, calculate $\angle EFC$.

[3]



15. Given that $ABCD$ is a rhombus, $AO = OC$, $\angle CDO = 51^\circ$, find the values of x and y .

[3]



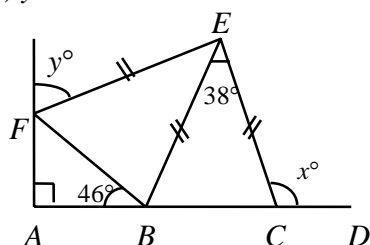
16. In the diagram, $\angle BAF = 90^\circ$, $\angle ABF = 46^\circ$, $\angle BEC = 38^\circ$, and $EF = EB = EC$. Find

(a) x ,

[2]

(b) y .

[3]

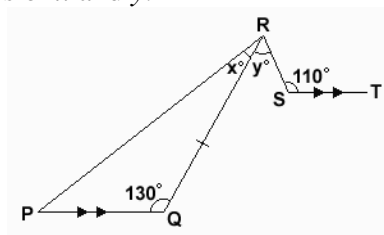


17. The exterior angles of a triangle are $(2x + 10)^\circ$, $(3x + 15)^\circ$ and $(4x + 20)^\circ$. Find the value of x . What is the largest interior angle of the triangle?

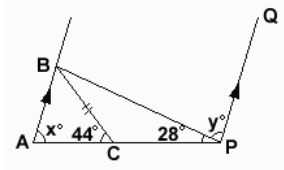
[4]

18. In the figure, $PQ = QR$, $PQ \parallel ST$, $\angle PQR = 130^\circ$, $\angle RST = 110^\circ$, $\angle PRQ = x^\circ$ and $\angle QRS = y^\circ$. Find the values of x and y .

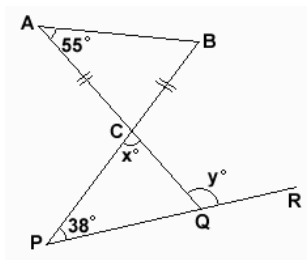
[4]



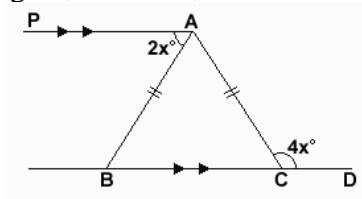
19. In the figure, $AC = BC$, $AB \parallel PQ$, $\hat{BAC} = x^\circ$, $\hat{BCA} = 44^\circ$, $\hat{BPC} = 28^\circ$ and $\hat{BPQ} = y^\circ$. Find the values of x and y . [4]



20. In the figure, $AC = BC$, $\hat{CAB} = 55^\circ$, $\hat{CPQ} = 38^\circ$, $\hat{PCQ} = x^\circ$ and $\hat{CQR} = y^\circ$. Find the values of x and y . [4]



21. In the figure, $AB = AC$, $\hat{PAB} = 2x^\circ$ and $\hat{ACD} = 4x^\circ$. Find the values of x and \hat{BAC} . [3]

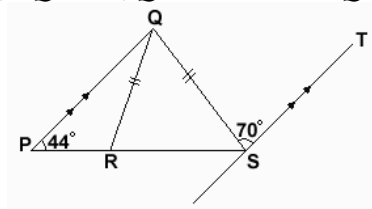


22. PQ and QR are adjacent sides of a regular polygon. PQ is produced to S such that $QS = QR$. If $\hat{QRS} = 81^\circ$, calculate

(a) \hat{SQR} ,

(b) the number of sides of the polygon. [4]

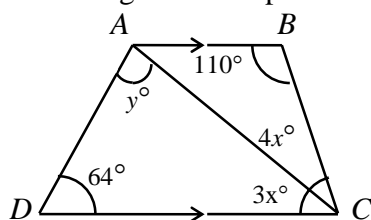
23. In the diagram, $QR = QS$, $PQ \parallel ST$, $\hat{QPR} = 44^\circ$ and $\hat{QST} = 70^\circ$. Calculate



(a) \hat{QRS} ,

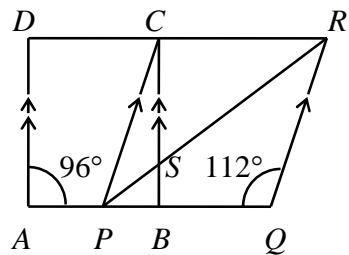
(b) \hat{PQR} . [4]

24. The interior angles of a pentagon are 85° , 106° , $(2x - 4)^\circ$, $(3x - 15)^\circ$ and $(200 - 2x)^\circ$. Calculate the value of x . [3]
25. The interior angle of a regular polygon is 162° . Calculate the number of sides of the polygon. [2]
26. (a) Given that each interior angle of a regular polygon is seven times the size of its exterior angle, find the number of sides of the polygon. [2]
 (b) Two of the interior angles of an octagon are each $3x^\circ$ and the remaining interior angles are each 140° . Calculate the value of x . [2]
27. The five exterior angles of a pentagon are in the ratio $3 : 3 : 4 : 5 : 5$. Calculate the (a) largest interior angle, (b) largest exterior angle. [3]
28. A polygon has n sides. Three of its interior angles are 50° , 60° and 70° . The remaining $(n - 3)$ exterior angles are each 15° . Calculate the value of n . [3]
29. (a) Find the size of an interior angle of a regular hexagon. [1]
 (b) If the exterior angles of a hexagon are in the ratio $1 : 2 : 2 : 3 : 4 : 6$. Calculate the smallest interior angle of the hexagon. [2]
 (c) Each interior angle of a regular polygon with 20 sides is 2° more than each interior angle of a regular polygon with n sides. Calculate the value of n . [2]
30. (i) Four of the interior angles of a pentagon are each equal to 104° . Calculate the fifth angle. [2]
 (ii) Calculate the size of an interior angle of a regular polygon with 24 sides. [1]
31. In the diagram AB is parallel to DC . Calculate the values of x and y . [4]



32. In the diagram, $ABCD$ and $CPQR$ are two rhombuses. If $\angle PQR = 112^\circ$ and $\angle BAD = 96^\circ$, calculate

- | | |
|--------------------|-----|
| (a) $\angle PRC$, | [1] |
| (b) $\angle QBC$, | [1] |
| (c) $\angle PSB$. | [2] |



Answers

1. $x = 10, y = 140$
2. $x = 54$
3. (a) 36° (b) 54°
4. (a) 37° (b) 115°
5. (a) 52° (b) 28° (c) 60°
6. 41
7. (a) 15 (b) 90
8. (a) 18 (b) 63°
9. (a) 44° (b) 96°
10. (a) 88° (b) 112°
11. (a) 70° (b) 55° , isosceles triangle
12. 36°
13. 101
14. 128°
15. $x = 39, y = 102$
16. (a) 109 (b) 73
17. $x = 35, 100^\circ$
18. $x = 25, y = 60$
19. $x = 68, y = 84$
20. $x = 70, y = 108$
21. $x = 30^\circ, \hat{BAC} = 60^\circ$
22. (a) 18° (b) 20

23. (a) 66° (b) 22°
24. 56
25. 20
26. (a) 16 (b) $x = 40$
27. (a) 126° (b) 90°
28. $n = 15$
29. (a) 60° (b) 60° (c) 18
30. (i) 124° (ii) 24°
31. $x = 10, y = 86$
32. (a) 34° (b) 96° (c) 62°

Chapter 16

Secondary 1 Mathematics

Chapter 16 Geometrical Constructions

GENERAL NOTES

This chapter deals with the efficient and accurate use of geometrical construction instruments. Pupils are free to use any of the geometrical construction tools to construct angles, perpendicular bisectors, angle bisectors etc unless stated otherwise. However, it is good practice to teach them how to use the compasses well such as to construct the perpendicular and angle bisectors and to use the compasses to construct angles of 60° , 30° and 45° where possible. Remind pupils to use sharp pencils.


XYZ SECONDARY SCHOOL

Name: _____ ()

Date: _____

Class: _____

Time allowed: min

Marks: 

Secondary 1 Mathematics Test Chapter 16 Geometrical Constructions

1. Construct a triangle ABC such that $AB = 6.8$ cm, $BC = 7.2$ cm and $\angle ABC = 58^\circ$.
Construct the bisector of $\angle BAC$ and let it cut BC at K . Measure and write down the length of AK . [4]
2. Construct a triangle PQR such that $PQ = 8.2$ cm, $\angle PQR = 75^\circ$ and $\angle QPR = 60^\circ$.
Construct a perpendicular from R to cut PQ at K . Measure and write down the length of PK . [4]
3. Construct $\triangle PQR$ such that $PQ = 8.6$ cm, $\angle PQR = 70^\circ$ and $\angle QPR = 60^\circ$.
(a) Measure and write down the length of PR .
(b) Construct the angle bisector of $\angle PRQ$.
(c) Construct the angle bisector of $\angle PQR$.
(d) If the two perpendicular bisectors of (b) and (c) meet at the point S , measure and write down the length of PS . [6]
4. Draw a line AB 3 cm long. AB is produced to C such that $BC = 6$ cm.
(a) Construct an equilateral triangle BCP with BC as a side.
(b) Construct the bisector of $\angle ABP$.
(c) Construct the perpendicular bisector of BP and let it meet the bisector of $\angle ABP$ at K .
(d) Measure and write down the length of BK . [6]
5. Construct in a single diagram triangle ABC such that $\angle ABC = 52^\circ$, $BC = 9.6$ cm and $AC = 7.8$ cm.
(a) Construct the bisector of $\angle BAC$ and let the bisector meet BC at P .
(b) Construct the perpendicular from C to AB and let it meet the bisector of $\angle BAC$ at Q . [5]
6. Construct a square whose diagonals are of length 11.5 cm. Measure the length of one side of the square. [3]
7. Construct a parallelogram $ABCD$ such that $AB = 8.4$ cm, $\angle ABC = 115^\circ$ and $BC = 5.6$ cm. Measure and write down the length of AC and BD . [5]

8. Construct $\triangle ABC$ such that $AB = 14$ cm, $BC = 10$ cm and $AC = 10.5$ cm. [1]
 - (a) Measure and write down the size of the largest angle. [1]
 - (b) On the same diagram
 - (i) construct the angle bisector of $\angle ABC$,
 - (ii) construct the perpendicular bisector of AB ,
 - (iii) mark with the letter X the point of intersection of the angle bisector of $\angle ABC$ and the perpendicular bisector of AB ,
 - (iv) measure the length of CX . [4]

9. Construct a parallelogram $PQRS$ in which $PQ = 8.6$ cm, $\angle PQR = 110^\circ$ and $QR = 5.4$ cm.
 - (a) Construct the bisector of $\angle QRS$. [2]
 - (b) Construct the perpendicular bisector of PQ . [2]
 - (c) If the bisector in (a) meets the bisector at X , measure the length of SX . [1]

10. Construct a quadrilateral $ABCD$ such that $AB = 10.2$ cm, $BC = 7.5$ cm, $AD = 6.8$ cm, $\angle ABC = 105^\circ$ and $\angle BAD = 110^\circ$.
 - (a) Construct the perpendicular bisector of CD .
 - (b) With B as the centre and radius 7 cm, draw an arc intersecting the perpendicular bisector of CD at P and Q . [5]

11. Construct a $\triangle ABC$ in which $AB = AC = 8$ cm and $BC = 10$ cm.
 - (a) What type of triangle is $\triangle ABC$?
 - (b) Measure and write down the value of \hat{ABC} . [5]

12. Construct $\triangle ABC$ in which $AB = 8$ cm, $BC = 9$ cm and $AC = 10.5$ cm.
 - (a) Measure and write down the values of \hat{ABC} , \hat{ACB} and \hat{BAC} .
 - (b) State the angle that faces the shortest side AB .
 - (c) State the angle that faces the longest side AC .
 - (d) State a conclusion from what you found from (b) and (c). [8]

13. Construct a $\triangle PQR$ in which $\hat{PQR} = \hat{PRQ} = 50^\circ$ and $QR = 8.5$ cm.
 - (a) Measure and write down the length of PQ and PR .
 - (b) State the name of $\triangle PQR$ and write a statement regarding the special property of this triangle. [6]

14. Construct $\triangle DEF$ in which $DE = 7.5$ cm and $\hat{DFE} = 50^\circ$ and $\hat{EDF} = 60^\circ$. Measure and write down the length of EF and DF . [5]

15. Construct a rectangle $ABCD$ in which $AB = 8.2$ cm and $BC = 5.6$ cm. Measure and write down the length of the diagonal AC and \hat{ACB} . [5]

16. Construct a parallelogram $PQRS$ in which $PQ = 5.8$ cm, $PS = 4.2$ cm and $\hat{PSR} = 65^\circ$. Measure and write down the lengths of the diagonals PR and QS . [6]
17. Construct a rhombus $HKMN$ in which $HK = 4.8$ cm and $HQ = 5.7$ cm. Measure and write down the size of \hat{HKM} . [6]
18. Construct a trapezium $SMRT$ in which $SM \parallel TR$, $SM = 4.2$ cm, $MR = 3.6$ cm, $TR = 6.3$ cm and $\hat{MRT} = 75^\circ$. Measure and write down the value of
(a) MT , (b) SR . [6]
19. Construct a quadrilateral $CITY$ in which $CI = 4.5$ cm, $CY = 4.8$ cm, $IT = 3.6$ cm, $\hat{YCI} = 95^\circ$ and $\hat{CIT} = 115^\circ$. Measure and write down the length of
(a) CT , (b) YI . [6]

Answers

1. 5.8 cm

2. 5.6 cm

3. (a) 10.5 cm (d) 4.7 cm

4. (d) 6 cm

6. 8.1cm

7. 11.9 cm, 7.9 cm

8. (a) 86° (b) (iv) 4.4 cm

9. (c) 4.9 cm

11. (a) isosceles triangle (b) 51°

12. (a) 56° , 48° , 76° (b) \hat{ACB}
(c) the angle facing the shortest side is smallest

13. (a) $PQ = PR = 6.6$ cm
(b) isosceles triangle, the sides opposite the equal angles are equal

14. $EF = 8.5$ cm, $DF = 9.2$ cm

15. 9.9 cm, 56°

16. 5.5 cm, 8.5 cm

17. 85°

18. (a) 6.4 cm (b) 6.2 cm

19. (a) 6.9 cm (b) 6.9 cm